

PRELIMINARY RESULTS OF A
RECREATIONAL USE ATTAINABILITY
ANALYSIS OF RUSH-COPPERAS CREEK
(1222B), DRY BRANCH (1255I), ALARM
CREEK (1226H), LITTLE GREEN CREEK
(1226M), CAMP CREEK (1204A),
TRIMMIER CREEK (1216A), DEER
CREEK (1242J), POND CREEK (1242F),
AND MIDDLE YEGUA CREEK (1212A)

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Summary

Rush-Copperas Creek

Unclassified water body 1222B is a 32 mile stream that was evaluated with 15 RUAA field surveys and 39 recreational use interviews. It originates in Rising Star and flows east southeast to Proctor Lake in Comanche County (Appendix 1). Initially, the stream flows through the town of Rising Star, after which, the stream flows through rural areas that consist of natural areas, pastures, and agricultural fields. Forest (35%), shrubs (35%), and pasture (22%) were the most frequently recorded riparian zones on Rush-Copperas Creek followed by mowed/maintained corridor (9%).

Four impoundments are located on Rush-Copperas Creek. Eleven substantial pools were found on the 15 reaches surveyed. The average measured thalweg and stream width was 0.52 m and 6.4 m, respectively. The stream type was categorized as intermittent with perennial pools (47 %), ephemeral (20%), and perennial (33%). The flow was characterized as no flow (33%), normal (27%), dry (20%), and low (20%). Seventy three percent of the time, field technicians characterized it as having enough water for primary contact. Twenty seven percent of the time, field technicians characterized it as not having enough water for primary contact. Based on the wastewater outfall shapefile, Rush-Copperas Creek had 1 domestic sewage outfall less than 1 MGD (million gallons per day) in the vicinity of Rising Star.

Based on the 39 recreational use interviews, sixty three percent of the people that participated in the interviews and their families use Rush-Copperas Creek for recreation. Among the interviewees that use the stream for recreation, 36% engage in primary contact recreation activities including swimming (8), tubing (1), and wading children (1). Seventy seven percent engage in secondary contact recreation activities including fishing for consumption (10), catch and release fishing (4), children playing on the shore (3), wading adults (2), and crawdad fishing (1). Interviewees have witnessed a variety of recreation activities currently occurring in Rush-Copperas Creek including swimming, children playing in the stream and on the shore, fishing, and boating. Interviewees characterized the dominant stream type as intermittent with perennial pools (34%), ephemeral (29%), intermittent (23%), and perennial (11%). Most of the

interviewees that do not use the stream for recreation have other personal interests (62%). Other reasons given for not using the stream were related to low or no water (15%), water quality (8%), thick vegetation (8%), dangerous wildlife (snakes) (8%), and lack of access because of private property (8%).

Five people were observed recreating at a public park along Rush-Copperas Creek. Recreational activities included adults walking and children playing in a playground next to the creek. One inner tube was found at site 1222B.16 indicating potential primary contact. One child's toy was found along the bank at site 1222B.20. Twenty five indications of fishing were found at 5 Rush-Copperas Creek survey sites including boats (2), fishing tackle (4), and drop lines (19). Eighteen of these were found at site 1222B.15. Two publicly owned recreation areas were found on Rush-Copperas Creek at survey points 1222B.19 and 1222B.20. General public access was estimated to be moderate.

Dry Branch

Unclassified water body 1255I is a 7.3 mile stream that was evaluated with 2 RUAA field surveys and 5 recreational use interviews. It originates 2.3 miles east of State Hwy 108 and 1.5 miles southwest of Eddy in Erath County and flows south to the confluence with the Upper North Bosque River. The stream flows through undeveloped areas that consist mostly of pastures with some forested riparian corridors. The stream runs adjacent to a golf course after entering the city limit of Stephenville. Shrubs (50%) and pasture (50%) were the dominant recorded riparian corridors on Dry Branch.

Seven impoundments are located on Dry Branch. Survey site 1255I.2 had an impoundment that had an average thalweg of 1.25 m and a length and width of 35 m and 40.5 m, respectively. Survey site 1255I.3 had an impoundment that had an average thalweg of 1.5 m and a length and width of 366 m and 440 m, respectively. No substantial pools in the natural stream reach were found at either of these survey sites. The average measured thalweg and stream width was 0.03 m and 0.0 m, respectively. The stream type was categorized as ephemeral (50%) and intermittent with perennial pools (50%). The flow was characterized as no flow (100%). At both sites, field technicians characterized the stream as having enough water for primary contact. Both of these

points, however, included impoundments and thus, may not be representative of the entire stream reach. No wastewater outfalls are located on the stream.

Out of 5 recreational use interviews, 3 of the interviewees do not use the stream. Reasons for not using the stream were low water or no water in the stream. One of the interviewees works at the golf course and picks golf balls out of the stream. Another interviewee, who has a large impoundment in the middle of their property, uses the stream for swimming, kayaking, boating, canoeing, fishing, and hunting. All age classes (adults, teenagers, and children) are involved in these recreational activities. These activities have been occurring during the spring and summer since 1978 to the present. One of the interviewees stated that “people used to fish in the stream, but no one has used the stream in a long time due to lack of water in the stream”. None of the people interviewed have witnessed or heard of recreational activities occurring in Dry Branch.

No primary contact or secondary contact recreational activities were observed by technicians during the field surveys. One fishing reel found in the creek bed at site 1255I.2 was the only indication of primary or secondary contact found. One publicly owned recreation area (Tejas Golf Course) was found on Dry Branch at the south end of the segment. General public access was estimated to be very limited.

Alarm Creek

Unclassified water body 1226H is a 17 mile stream that was evaluated with 7 RUAA field surveys and 12 recreational use interviews. It originates 2.2 miles northwest of US Hwy 67 and 2.6 miles west of Stephenville and flows southeast to the confluence with the Upper North Bosque River in Erath County. The stream generally flows through undeveloped areas with the exception of one commercial/industrial property. Forest (36%) and shrubs (36%) were the most frequently recorded riparian zones on Alarm Creek followed by mowed/maintained corridor (18%).

Three impoundments are located on Alarm Creek. One of these impoundments found at survey site 1226H.4 had an average thalweg of 1.5 m and a length and width of 583 m and 75 m, respectively. No substantial pools in the natural stream reach were found on the stream. The average measured thalweg and stream width was 0.11 m and 1.27 m, respectively. The stream

type was categorized as intermittent with perennial pools (57 %) and ephemeral (43%). The flow was characterized as dry (43%), no flow (43%), and low (14%). Eighty five percent of the time, field technicians characterized it as not having enough water for primary contact. No wastewater outfalls are located on the stream.

Based on 12 recreational use interviews, 36 % of the people and their families use the stream for recreation. Interviewees reported that no current primary contact recreation activities occur on the stream. One of the interviewees however, reported that children (including kids in their family) used to wade and swim in the stream until the water quality deteriorated after a dairy farm opened upstream and there was a lot of runoff into the creek. Secondary contact recreation activities including boating (1) and fishing (3) were reported. None of the people interviewed have witnessed recreational activities occurring in the creek. Interviewees characterized the dominant stream type as ephemeral (58%) and intermittent with perennial pools (25%). Interviewees stated that they do not recreate on the stream due to low or no water (57%) and poor water quality (29%).

No primary contact or secondary contact recreation activities were observed by technicians during the field surveys. One old pair of swimming trunks was found at site 1226H.2 indicating potential primary or secondary contact. One child's toy was found along the bank at site 1226H.1. One boat and one occurrence of fishing tackle were found at site 1226H.4. One occurrence of fishing tackle was also found at site 1226H.6. No public recreation areas were found on Alarm Creek. General public access was estimated to be very limited.

Little Green Creek

Unclassified water body 1226M is a 5.8 mile stretch of Little Green Creek that was evaluated with 3 RUAA field surveys and 1 recreational use interview. It begins 6.7 miles east southeast of Dublin, and flows eastward to the confluence with Green Creek in Erath County. The stream flows through rural areas that consist mostly of pastures. Shrubs (50%) and denuded/eroded banks (50%) were the two riparian zones recorded on Little Green Creek.

No impoundments are located on Little Green Creek. Two substantial pools were found on the stream. The average measured thalweg and stream width was 0.52 m, and 5.0 m, respectively.

The stream type was categorized as intermittent with perennial pools (100 %). The flow was characterized as low (100%). Sixty seven percent of the time, field technicians characterized it as having enough water for primary contact. Thirty three percent of the time, it was characterized as not having enough water for primary contact. No wastewater outfalls are located on the stream.

One recreational use interview was conducted on this stream. This person and his family do not use Little Green Creek for recreation due to low water or lack of water in the stream. The interviewee has not witnessed or heard of recreational activities occurring in Little Green Creek currently or in the past (for 21 years). The interviewee classified the stream as intermittent with perennial pools.

No primary contact or secondary contact recreation activities were observed by technicians during the field surveys. No indications of human use were found during the 3 surveys. No public recreation areas were found on Little Green Creek. General public access was estimated to be moderate.

Camp Creek

Unclassified water body 1204A is an 11 mile stream that was evaluated with 5 RUAA field surveys and 9 recreational use interviews. It originates 0.75 miles north of US Hwy 67 and 6 miles west of Cleburne in Johnson County and flows south to the confluence with the Brazos River. The stream flows through rural areas that consist of pastures, agricultural fields, and natural areas. Forest (38%) and shrubs (38%) were the most frequently recorded riparian zones on Camp Creek followed by pastures (13%).

Four impoundments are located directly on Camp Creek. A fifth impoundment is located 45 meters to the east of creek. One of the 4 impoundments found at survey site 1204A.1 had an average thalweg of 1.5 m and a length and width of 70 m and 60 m, respectively. One substantial pool was found on the 5 reaches surveyed. The average measured thalweg and stream width was 0.19 m, and 1.9 m, respectively. The stream type was categorized as intermittent with perennial pools on all surveys. The flow was characterized as low (60%) and no flow (40%). Sixty percent of the time, field technicians characterized it as not having enough water for primary contact. Forty percent of the time, it was characterized as having enough water for

primary contact. Camp Creek had 1 one industrial wastewater outfall located in the vicinity of Park Road 21 approximately half way down the stream.

Based on the 9 recreational use interviews, 63 % of the people and their families use the stream for recreation. Interviewees reported instances of primary contact including swimming (3), rafting (small pool style raft used as a swim aid) (1), and wading children (3). A few interviewees reported significant primary contact recreation activities occurring in the past. Two interviewees described a swimming hole called Little Falls where there is a rope swing and small water fall. Secondary contact recreation activities including wading adults (2), fishing for consumption (2), and catch and release fishing (1) were reported. Two interviewees have witnessed recreational activities currently occurring in the stream including swimming, tubing, wading by children, wading by adults, kayaking, and playing on shore or banks. Interviewees characterized the dominant stream type as intermittent with perennial pools (63%), intermittent (13%), and perennial (13%). Interviewees stated that water levels have decreased significantly in recent years and activities of oil companies may be affecting water levels and water quality.

No primary contact or secondary contact recreation activities were observed by technicians during the field surveys. One occurrence of fishing tackle was the only indication of human use related to primary or secondary contact recreation found during the surveys. No public recreation areas were found on Camp Creek. General public access was estimated to be very limited.

Trimmier Creek

Unclassified water body 1216A is a 7.6 mile stream that was evaluated with 5 RUAA field surveys and 12 recreational use interviews. It originates 3.9 miles south southeast of the intersection of US Highway 190 and State Highway 195 in Killeen to Stillhouse Hollow Reservoir in Bell County. The stream generally flows through both residential and natural areas including the Corps of Engineers Wildlife Area at the south end of the stream. Shrubs (36%) and mowed/maintained corridor (33%) were the two dominant riparian zone corridors on the stream.

One impoundment is located on Trimmier Creek. Two substantial pools were found (1 at survey site 1216A.3 and at least 1 at survey site 1216A.5) on the 5 reaches surveyed. Survey site 1216A.5 was too deep to measure by field technicians. More than one substantial pool may have

been present at this site. The average measured thalweg and stream width was 0.52 m and 6.5 m, respectively. The stream type was categorized as perennial (80 %) and ephemeral (20%). The flow was characterized as normal (60%), dry (20%), and low (20%). Sixty percent of the time, field technicians characterized it as having enough water for primary contact. Forty percent of the time, field technicians characterized it as not having enough water for primary contact. No wastewater outfalls are located on the stream.

Based on the 12 recreational use interviews, thirty three percent of the people that participated in the interviews and their families use Trimmier Creek for recreation. One of the interviewees that uses the stream for recreation allows their children to wade in the stream. Three of the interviewees that use the stream for recreation engage in secondary contact 1 recreation activities including wading by adults. Interviewees have witnessed a variety of recreation activities currently occurring in the creek including swimming, fishing for consumption, catch and release fishing, wading by adults, picnicking, and playing on shore or banks. Interviewees characterized the dominant stream type as perennial (75%), intermittent with perennial pools (17%), and ephemeral (8%). Interviewees stated that they do not recreate on the stream due to low or no water (57%), and poor water quality (29%).

No primary contact recreational activities were observed by technicians during the field surveys. Three people were observed releasing a turtle into Trimmier Creek. Eighteen indications of fishing were found at 3 survey sites including fishing tackle (10), drop lines (2), bait containers (4), a fishing rod, and a crawfish trap. Twelve of these were found at site 1216A.5. The only public recreation area found was the Corps of Engineers Wildlife Area at survey point 1216A.5. General public access was estimated to be moderate.

Deer Creek

Unclassified water body 1242J is a 27 mile stream that was evaluated with 15 RUAA field surveys and 46 recreational use interviews. It originates 0.34 miles northwest of US Hwy 81 and 1.5 miles southwest of Eddy and flows east to the confluence with the Brazos River in Falls County. The stream flows through rural areas that consist of pastures, agricultural fields, and natural areas. Forest (45%) and shrubs (32%) were the most frequently recorded riparian zones on Deer Creek followed by pasture (16%).

No impoundments were found on Deer Creek. Eight substantial pools total were found on the 15 reaches surveyed. Survey site 1242J.16 was too deep to measure by field technicians. This site may have had more than one substantial pool. The average measured thalweg and stream width was 0.32 m and 3.7 m, respectively. The stream type was categorized as ephemeral (40%), intermittent with perennial pools (27 %), perennial (20%), and intermittent (13%). The flow was characterized as no flow (40%), dry (20%), low (20%), and normal (20%). Sixty percent of the time, field technicians characterized it as not having enough water for primary contact. Deer Creek had 1 domestic sewage outfall less than 1 MGD in the vicinity of Chilton (near FM 107/CR 494N).

Based on the 46 recreational use interviews, half of the people that participated and their families use Deer Creek for recreation. Among the interviewees that use the stream for recreation, 36% engage in primary contact recreation activities and 36% engage in secondary contact 1 recreation activities. Current primary contact activities include swimming (2), rafting (small pool style rafts used as a swim aids) (2), and wading children (4). Among the interviewees that specifically stated using the stream for primary contact recreation activities, 25% reported using the stream for over 30 years, 25% have used the stream for nearly 20 years, 13% have used the stream for over 10 years, and 38% have used the stream for less than 10 years. Secondary contact recreation activities include fishing for consumption (3), boating (1), wading adults (1), crawdad fishing (1), and releasing turtles (1). Interviewees have witnessed a variety of recreational activities currently occurring in the stream including swimming, rafting (small pool style raft used as a swim aid), boating, kayaking, fishing for consumption, and hunting. Interviewees characterized the dominant stream type as ephemeral (43%), intermittent with perennial pools (27%), intermittent (25%), and perennial (5%). Half of the interviewees that do not use the stream for recreation have other personal interests. Other reasons given for not using the stream were related to physical characteristics of the stream (low or no water (32%), steep banks (5%), and water quality (5%)).

No primary contact or secondary contact recreation activities were observed by technicians during the field surveys. One inner tube was found at site 1242J.2 indicating potential primary contact. Multiple children's toys (dolls) and a small fort made of rocks were also found at this site indicating that children use the stream for recreation. Five indications of fishing were found

at 3 survey sites including fishing tackle (3) and bait containers (2). No public recreation areas were found on Deer Creek. General public access was estimated to be moderate.

Pond Creek

Unclassified water body 1242F is a 28 mile stream that was evaluated with 15 RUAA field surveys and 27 recreational use interviews. It originates 2 miles east of Troy in Bell County and flows east southeast to the confluence with the Brazos River in Milam County. The stream flows through rural areas that consist of pastures, agricultural fields, and natural areas. Forest (50%) and shrubs (25%) were the most frequently recorded riparian zones followed by pasture (25%).

Two impoundments are located directly on Pond Creek. Nine substantial pools total were found on the 15 reaches surveyed. Survey site 1242F.14 was too deep to measure by field technicians. This site may have had more than one substantial pool. The average measured thalweg and stream width was 0.29 m and 1.8 m, respectively. The stream type was categorized as intermittent with perennial pools (53 %), intermittent (33%), and perennial (13%). The flow was characterized as no flow (53%), normal (33%), and dry (13%). Sixty six percent of the time, field technicians characterized it as not having enough water for primary contact. Thirty three percent of the time, it was characterized as having enough water for primary contact. Pond Creek had 1 domestic sewage outfall less than 1 MGD in the vicinity of Rosebud.

Based on the 27 recreational use interviews, 58 % of the people and their families use the stream for recreation. Among the interviewees that use the stream for recreation, 13% reported engaging in primary contact recreation activities which include swimming (1), boogie boarding (1), tubing (1), and wading by children (1). Forty percent reported engaging in secondary contact 1 recreation activities including fishing for consumption (3), catch and release fishing (3), and wading adults (1). Interviewees have witnessed a variety of recreation activities currently occurring in the stream including swimming, wading by children, fishing, wading by adults, and hunting. Interviewees characterized the dominant stream type as intermittent with perennial pools (38%), ephemeral (27%), intermittent (23%) and perennial (12%). Most of the interviewees that do not use the stream for recreation stated that the water level is too low (91%). Other reasons given for not using the stream were related to water quality (9 %), limited access (18%), and potentially dangerous wildlife (copperhead snakes) (9%).

No primary contact or secondary contact recreation activities were observed by technicians during the field surveys. Six indications of fishing were found at 4 survey sites including fishing tackle (3), one drop line, one bait container, and one fishing reel. No public recreation areas were found on the stream. General public access was estimated to be moderate.

Middle Yegua Creek

Unclassified water body 1212A is a 50 mile stretch of Middle Yegua Creek that was evaluated with 27 RUAA field surveys and 59 recreational use interviews. It begins 8 km northeast of Elgin and flows eastward to the confluence with Yegua Creek just before entering into Lake Sommerville. The stream flows through rural areas that consist of pastures, forested corridors, natural areas, and agricultural fields. Forest (35%), shrubs (28%), and pasture (28%) were the most frequently recorded riparian zones on Middle Yegua Creek followed by mowed/maintained corridor (7%).

One impoundment is located on Middle Yegua Creek. Seventeen substantial pools were found on the 27 reaches surveyed. The average measured thalweg and stream width was 0.46 m and 4.9 m, respectively. The stream type was categorized as perennial (78 %), intermittent with perennial pools (18 %), and ephemeral (4%). The flow was characterized as low (59%), normal (19%), dry (11 %), and no flow (14%). Sixty seven percent of the time, field technicians characterized it as having enough water for primary contact. Thirty three percent of the time, it was characterized as not having enough water for primary contact. Middle Yegua Creek had 1 one industrial wastewater outfall located in the vicinity of County Road 306. A tributary stream of Middle Yegua Creek approximately 10.5 km due west of the city of Lexington has one industrial wastewater outfall 3.2 km upstream of where it appears to flow into Middle Yegua Creek.

Based on the 59 recreational use interviews, 24% of these interviewees reported engaging in primary contact recreation activities which included swimming (5), hand fishing or noodling (1), knee boarding (1), rafting (small pool style raft used as a swim aid) (1), and wading by children (1). Sixty nine percent reported engaging in secondary contact 1 recreation activities including fishing for consumption (17), catch and release fishing (3), bowfishing (1), and wading adults (1). Interviewees have witnessed a variety of recreational activities currently occurring in the stream including swimming, wading by children, wading by adults, boating, and fishing for

consumption. Interviewees characterized the dominant stream type as perennial (59%), intermittent (21%), ephemeral (16%), and intermittent with perennial pools (5%). Most of the interviewees that do not use the stream for recreation have other personal interests. Other reasons given for not using the stream related to changes in water level and water quality, poor access or lack of access due to the stream being on private property, and potentially dangerous wildlife.

Through conversations with park staff and participants of the informational meeting held at Nails Creek State Park, we found that the white bass spawning run of Middle Yegua Creek was an extremely significant seasonal event for fisherman and their families and friends. Every year between February and April, when water levels are adequate in Lake Somerville and Middle Yegua Creek, the white bass living in the lake migrate in large numbers up the stream to spawn. In most years, these spawning runs attract hundreds of fisherman who drive, kayak, canoe and/or hike to the stream to catch large numbers of white bass and other fish species. Many people who fish this stream during this spawning run have been doing it for decades and come several times per season. Many families participate together in this fun activity with multiple generations of family members fishing together. Local residents, college students from TAMU, and people living hours away come to the stream to fish and recreate. Additional information can be found on the Texas Fishing Forum (<http://texasfishingforum.com/forums/ubbthreads.php>).

No primary contact or secondary contact recreation activities were observed by technicians during the field surveys. One rope swing and associated ladder (positioned to be used to climb out of the stream) were found at site 1212A.22. Another rope swing was found at site 1212A.30. A rope for climbing up the bank was found at site 1212A.23. Remnants of kid's play (flip flops) were found at site 1212A.11. One hundred and sixteen indications of fishing were found at 27 survey sites including fishing tackle (61), drop lines (31), bait containers (21), a fishing net, a rod holder, and a boat. Twenty six, 18, 13, and 12 of these were found at sites 1212A.13, 1212A.11, 1212A.23, and 1212A.14, respectively. Middle Yegua Creek has one public recreation area (Somerville Wildlife Management Area) which is located at the downstream end of the stream at survey points 1212 A.27, 1212 A.28, 1212 A.29, and 1212 A.30. General public access was estimated to be moderate.

Introduction

Section 101(a)(2) of the Federal Water Pollution Control Amendments of 1972 or the Clean Water Act (the Act) states it is the national goal, wherever attainable, to provide for the protection and propagation of fish, shellfish, and wildlife and provide for recreation in and on the waters of the United States. Under section 131.10(j) of the Water Quality Standards Regulation of the United States Environmental Protection Agency (EPA), States are required to conduct a use attainability analysis (UAA) whenever the State designates uses of water bodies that do not include the uses specified in section 101(a)(2) of the Act, removes one of these designated uses, or adopts subcategories of these uses that require less stringent criteria.

A UAA (or RUAA) is a structured scientific assessment of the factors affecting the attainment of a use on a water body. The overall purpose of a RUAA is to make sure streams have the correct recreational use classification following the guidelines established in the Act. The ultimate goal is that the new designated use classification is more accurate.

RUAs may include physical, chemical, and biological evaluations to determine what factors impair attainment of designated uses and provide information to determine what uses are appropriate and feasible for the water body in question. Important factors in such analyses can include naturally occurring pollutant concentrations, anthropogenic sources of pollution, water depth, hydrological modifications, and natural physical characteristics of streams that could impair the use. In addition, RUAs typically assess the current uses (recreation and otherwise) of the water bodies under evaluation.

States use the information collected in a RUAA to demonstrate to the EPA that attaining the uses in section 101(a)(2) are not feasible because:

1. naturally occurring pollutant concentrations prevent the attainment of the use;
2. natural, ephemeral, intermittent, or low- flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges without violating State water conservation requirements to enable uses to be met;

3. human-caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place;
4. hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the water body to its original condition or to operate such modification in a way that would result in the attainment of the use;
5. physical conditions related to the natural features of the water body, such as the lack of a proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to [chemical] water quality, preclude attainment of aquatic life protection uses; or
6. controls more stringent than those required by sections 301(b)(1)(A) and (B) and 306 of the Act would result in substantial and widespread economic and social impact.

On June 15 through August 22, 2012, a team from Texas AgriLife Research, Texas A&M University System, carried out RUAAAs for the Rush-Copperas Creek (1222B), Dry Branch (1255I), Alarm Creek (1226H), Little Green Creek (1226M), Camp Creek (1204A), Trimmier Creek (1216A), Deer Creek (1242J), Pond Creek (1242F), and Middle Yegua Creek (1212A) (Table 1). Following the methodology in TCEQ's 2012 Recreational Use Attainability Analysis Procedures, team members talked with landowners on these streams, interviewed recreational users, and collected data. The Water Quality Standards Group within the TCEQ will use this information to potentially classify or reclassify streams in the categories of primary contact recreation, secondary contact 1 recreation, secondary contact 2 recreation, and non-contact recreation.

Methods

Creation of a GIS Project

An ESRI ArcMap GIS project was created to acquire the information needed to carry out the RUAA site surveys. Stream shapefiles were obtained from TCEQ. Shapefiles of Texas counties, cities, major roads, and stream point sources (tx_wastewtr outfall) were obtained from TCEQs Atlas of Texas Surface Waters. A watershed shapefile (basinspy) was obtained from Texas Parks and Wildlife. Aerial photographs (2010 NAIP 1m) and street shapefiles were obtained from the Texas Natural Resources Information System. Shapefiles (polygons) of private property parcels were obtained from county property appraiser offices. A shapefile (Park Lands Combined) containing all known recreation areas in the study area was created.

Photograph Naming Convention

In sequence, photograph names (i.e. 1242D.1.30_25Up_08032009_23207) provide the segment identification code for the specific survey site, the location in meters along the stream reach where the photograph was taken, a photo number assigned by the camera, a code which describes the contents, the date, and the time of day to the nearest second. Photographs taken at locations other than 30, 150, or 300 meters along the reach do not have reach location (distance along the reach) information. The example photograph name above was an upstream photograph, 30 meters along the reach at survey site 1242D.1 with a camera photo number of 25. This example photograph was taken on August 3, 2009 at 2:32 pm and 7 seconds. Content codes include Up (up stream), Dwn (down stream), LB (left bank), RB (right bank), HP (human presence), IHU (indications of human use), IPC (indication of primary contact recreation), SC (surrounding conditions), SPA (site/public access), PR (promote recreation), PP (public park), IR (impede recreation), G (garbage or debris), UC (unsafe condition), CO (channel obstructions), FPS (flowing point source or NPDES discharge), HM (hydrologic modifications), Dam (dam or on channel impoundment), W (wildlife or animal evidence (not related to sustained aquatic habitat)), and SAH (sustained aquatic habitat).

Sampling Design and Site Selection

Systematic and purposive sampling methods were used to select survey sites on project streams. Using the TCEQ stream shapefiles, survey stations were generally evenly spaced every 1.67 miles or 3 points per 5 mile segment of stream. This methodology ensured that the survey sites provide a representative sample of the conditions that exist along the entire population of streams. In order to ensure that recreational use was targeted for measurement, evenly spaced points were replaced with sites near these points where recreation was most likely to occur. These targeted areas of recreational use included public parks, bridges, and other areas that are accessible to recreational users. Every effort was made to survey all sites. Some survey sites however, were not sampled due to the lack of permission from private property owners. In these cases, alternative sites were found and surveyed whenever possible.

Collected Data for Each Stream Survey Sites

Field data was collected based on TCEQ's Recreational Use Attainability Analyses Procedures for a Basic RUAA Survey (2012). Following these procedures, Contact Information Forms (Appendix 2), RUAA Summaries (Appendix 5), Field Data Sheets (Appendix 3), and RUAA Interview Form (Appendix 4) were completed for each RUAA stream survey site. Monthly Palmer Drought Index data was obtained NOAA's National Climatic Data Center's Climate Monitoring Climate Monitoring Palmer Indices website (<http://www.ncdc.noaa.gov/oa/climate/research/prelim/drought/pdiimage.html>). Daily precipitation data was obtained from NOAA's National Climatic Data Center (<http://cdo.ncdc.noaa.gov/dly/DLY>). Averaged daily precipitation data was used to produce preceding 30 day and 7 day precipitation summary statistics.

Statistical Analyses

Basic statistical analyses were used to summarize collected RUAA data. Quantitative data such as average thalweg, and average precipitation were determined by calculating the mean. Categorical data was summarized by counting the number of occurrences or calculating the proportion of occurrence out of the total number recorded.

Completion of RUAA Summaries

The average thalweg for each stream was determined by calculating the mean thalweg for each survey site and then the mean of these means for each stream. Microsoft Autofilter was used to sort the data and determine which streams had substantial pools deeper than 1 m. Observations on use and the general level of public access were determined by using multiple sources of information. Observations on use including primary contact, secondary contact (1 & 2), and noncontact recreation activities were primarily determined by considering information provided by interviews with land owners surrounding the streams. The second factor considered came from the information recorded by survey teams, and the last factor considered were field observations of indications of human use at survey sites. The general level of public access was determined primarily by survey team's responses to "Describe Access Opportunities" for each survey site and secondarily on "Bank Access", "Surrounding Conditions that Impede Recreation", and the number of recreation areas located for each stream.

Results

Summary of the Informational Meetings

Informational meetings were carried out to present information to the public about TCEQ's RUAA Program, answer questions about RUAA's and our work on specific project streams, and talk to local residents and stakeholders about their knowledge and use of these streams. Joe Martin from the Water Quality Standards Group at the TCEQ and John Baker from TAMU presented power point presentations describing TCEQ's RUAA program. Technicians from TAMU interviewed landowners and stakeholders during each meeting.

The informational meeting for the RUAA's being carried out on Rush-Copperas Creek, Dry Branch, Alarm Creek, Little Green Creek, and Camp Creek was held at the Texas AgriLife Research Extension Office on US Highway 281 in Stephenville, Texas at 6:00 pm on Thursday, June 14, 2012. To advertise for this meeting, 89 flyers were posted in public areas and municipal buildings around the streams on June 1 and a public announcement was placed in the Stephenville Empire-Tribune on June 10 and June 13. Sixteen stakeholders participated in this meeting.

The informational meeting for Trimmier Creek, Deer Creek, and Pond Creek was held at the Temple Public Library in the Gladys Blaylock McLane Room in Temple, Texas at 6:00 pm on Thursday, July 12, 2012. Ninety six flyers were posted in public areas and municipal buildings around the streams on June 26 and 27 and July 3 and a public announcement was placed in the Temple Daily Telegram on July 1, 8, and 11. Thirteen stakeholders participated in this meeting.

The meeting for Middle Yegua Creek was held at Nails Creek State Park on Lake Somerville in Ledbetter, Texas at 6:00 pm on August 2, 2012. One hundred and two flyers were posted in public areas and municipal buildings around Middle Yegua Creek on July 27 and 28. In addition, TAMU field technicians advertised for the meeting in person by knocking on the doors of residents living on the stream and called by phone all property owners on Middle Yegua Creek who had publically available phone numbers. Phone numbers were acquired from local phone

books, the Lee County Property Appraisal District, and www.whitepages.com. Twelve stakeholders participated in this meeting.

General Stream Characteristics

Across all nine surveyed streams, shrub dominated riparian zones were the most frequently recorded (40.1%), followed by forest (26.6%), pasture (17.1%), denuded/eroded banks (8.9%), and mowed/maintained corridors (7.4%) (Table 2). Shrub dominated corridors and forest were the dominant riparian zones (recorded with an equal frequency) on Rush Copperas Creek, Alarm Creek, and Camp Creek. Shrubs and pasture were the dominant riparian zones on Dry Branch and recorded with an equal frequency on Pond Creek, and Middle Yegua Creek. On Trimmier Creek the most frequently recorded riparian zone was shrubs (67%). Forest was the most frequently recorded riparian zone on Deer Creek (45%), Pond Creek (50%), and Middle Yegua Creek (35%).

Six hydrological stream measurements, including continuous and categorical hydrological field observations, were collected during the RUAA to provide a measure of the amount of water in each stream at the time of survey and the stream's potential for recreation (Table 3). All creeks had average thalweg ≤ 0.52 m. Rush-Copperas Creek had an average width of 6.4 m and average thalweg of 0.52 m. Flow status was variable across survey sites. Field technicians characterized it as intermittent with perennial pools at 40% of the survey sites and as perennial at 33% of the survey sites. Most survey sites had enough water for primary contact (73%). Only two sites were sampled at Dry Branch. The creek had a typical width of 0 m and average thalweg of 0.03 m. Both survey sites had no flow at the time of survey. Field technicians characterized one site as ephemeral with an impoundment and the second site as intermittent with perennial pools. Both sites had enough water for primary contact. Alarm Creek had the largest average width (11.8 m). In most instances, the stream was not flowing (43%) or was dry (43%). Field teams characterized Alarm Creek as intermittent with perennial pools at 57% of the survey sites and at most survey sites there was not enough water for primary contact (71%). Little Green Creek had an average width of 5.0 m and average thalweg of 0.52 m. Low flow conditions were registered at all survey sites. Field technicians characterized it as intermittent with perennial

pools at all survey sites and as having enough water for primary contact at 67% of the survey sites. Camp Creek had an average width of 1.9 m and average thalweg of 0.19 m. In most instances, flow status was low (60%) or not flowing (40%). Field technicians characterized it as intermittent with perennial pools at all survey sites and as having enough water for primary contact at 40% of the survey sites. Trimmier Creek had an average width of 6.5 m and average thalweg of 0.52 m. Normal flow conditions were registered at most sites (60%). Field technicians characterized it as perennial at 80% of the survey sites and as having enough water for primary contact at 60% of the survey sites. Deer Creek had an average width of 3.7 m and average thalweg of 0.32 m. Flow status was variable across survey sites. Field technicians characterized it as ephemeral at 40% of the survey sites and as intermittent with perennial pools at 27% of the survey sites. There was enough water for primary contact at 40% of the survey sites. Pond Creek had an average width of 1.8 m and average thalweg of 0.29 m. No flow conditions were registered at 53% of the survey sites while normal flow was registered at 33% of the sites. Field technicians characterized it as intermittent with perennial pools at 53% of the survey sites and as intermittent at 33% of the survey sites. Middle Yegua Creek had an average width of 4.9 m and average thalweg of 0.46 m. Low flow conditions were registered at 59% of the survey sites while normal flow was registered at 19% of the sites. Field technicians characterized it as perennial at 78% of the survey sites and as having enough water for primary contact at 67% of the survey sites.

Based on the tx wastewtr outfall shapefile, Rush-Copperas Creek, Deer Creek, and Pond Creek had 1 domestic sewage outfall less than 1 MGD in the vicinity of Rising Star, Chilton (near FM 107/CR 494N), and Rosebud, respectively (Appendix 1). Camp Creek and Middle Yegua Creek had 1 one industrial wastewater outfall located in the vicinity of Park Road 21 (approximately half way down the stream) and County Road 306, respectively. A tributary stream of Middle Yegua Creek approximately 10.5 km due west of the city of Lexington has one industrial wastewater outfall 3.2 km upstream of where it appears to flow into Middle Yegua Creek. No domestic wastewater treatment plant outfalls greater than or equal to 1 MGD were located on any of the project streams.

The RUAA summary for each stream (Appendix 5) is presented in Table 4. Primary contact, secondary contact 1, secondary contact 2, and non-contact frequency were characterized as

occurring frequently for Rush Copperas Creek, Camp Creek, Deer Creek, Pond Creek, and Middle Yegua Creek. Primary contact, secondary contact 1, secondary contact 2, and non-contact frequency were characterized as occurring seldom for Dry Branch and Alarm Creek. The primary contact, secondary contact 1, secondary contact 2, and non-contact frequency for Trimmier Creek were characterized as occurring seldom, frequently, frequently, frequently, respectively. Only 3 surveys and 1 interview were conducted on Little Green Creek. In addition, no recreation was witnessed by field technicians and no indications of human use were found at the survey sites. Based on this, the primary contact, secondary contact 1, secondary contact 2, and non-contact frequency for Little Green Creek were characterized as not observed or reported.

Table 1. General RUAA stream characteristics.

Stream	Water body Name	Stream Type	Total Stream Miles	No. Surveys
1222B	Rush-Copperas Creek	Unclassified	32	15
1255I	Dry Branch	Unclassified	7.3	2
1226H	Alarm Creek	Unclassified	17	7
1226M	Little Green Creek	Unclassified	5.8	3
1204A	Camp Creek	Unclassified	11	5
1216A	Trimmier Creek	Unclassified	7.6	5
1242J	Deer Creek	Unclassified	27	15
1242F	Pond Creek	Unclassified	28	15
1212A	Middle Yegua Creek	Unclassified	50	27
Total			185.7	94

Table 2. Sum of the left bank and right bank riparian zone corridor categorical observations with the percent of the dominant riparian zone categories calculated for each stream.

Stream	Sum Forest	% Forest	Sum Shrub	% Shrub	Sum Pasture	% Pasture	Sum Mowed	% Mowed	Sum Denuded/ Eroded	% Denuded/ Eroded
Rush-Copperas Creek	16	35	16	35	10	22	4	9	0	0
Dry Branch	0	0	2	50	2	50	0	0	0	0
Alarm Creek	8	36	8	36	0	0	4	18	2	9
Little Green Creek	0	0	6	50	0	0	0	0	6	50
Camp Creek	6	38	6	38	2	13	0	0	2	13
Trimmier Creek	0	0	4	67	0	0	2	33	0	0
Deer Creek	28	45	20	32	10	16	0	0	4	6
Pond Creek	16	50	8	25	8	25	0	0	0	0
Middle Yegua Creek	30	35	24	28	24	28	6	7	2	2

Table 3. Hydrological stream characteristics. Proportional frequencies represent the number of times a condition was recorded at a stream over the number of sites surveyed per stream.

Stream	Avg Width (m)	Avg Thalweg (m)	Flow Frequency		Stream Type Frequency		Channel Frequency		Water for Prim Contact? Frequency	
Rush-Copperas Creek	6.4	0.52	0.20	Dry	0.20	Ephemeral	0	Non-wadeable	0.73	Yes
			0.20	Low	0	Intermittent	1	Wadeable	0.27	No
			0.33	No flow	0.47	Intermittent w/ perennial pools			0	No, stream not flowing
			0.27	Normal	0.33	Perennial				
Dry Branch	0.0	0.03	0	Dry	0.5	Ephemeral	0	Non-wadeable	1	Yes
			0	Low	0	Intermittent	1	Wadeable	0	No
			1	No flow	0.50	Intermittent w/ perennial pools			0	No, stream not flowing
			0	Normal	0	Perennial				
Alarm Creek	11.8	0.11	0.43	Dry	0.43	Ephemeral	0.14	Non-wadeable	0.14	Yes
			0.14	Low	0	Intermittent	0.86	Wadeable	0.71	No
			0.43	No flow	0.57	Intermittent w/ perennial pools			0.14	No, stream not flowing
			0	Normal	0	Perennial				
Little Green Creek	5.0	0.52	0	Dry	0	Ephemeral	0	Non-wadeable	0.67	Yes
			1	Low	0	Intermittent	1	Wadeable	0.33	No
			0	No flow	1	Intermittent w/ perennial pools			0	No, stream not flowing
			0	Normal	0	Perennial				
Camp Creek	1.9	0.19	0	Dry	0	Ephemeral	0	Non-wadeable	0.40	Yes
			0.60	Low	0	Intermittent	1	Wadeable	0.40	No
			0.40	No flow	1	Intermittent w/ perennial pools			0.20	No, stream not flowing
			0	Normal	0	Perennial				

Table 3 Continued.

Stream	Avg Width (m)	Avg Thalweg (m)	Flow Frequency		Stream Type Frequency		Channel Frequency		Water for Prim Contact? Frequency	
Trimmier Creek	6.5	0.52	0.20	Dry	0.20	Ephemeral	0.20	Non-wadeable	0.60	Yes
			0.20	Low	0	Intermittent	0.80	Wadeable	0.20	No
			0	No flow	0	Intermittent w/ perennial pools			0.20	No, stream not flowing
			0.60	Normal	0.80	Perennial				
Deer Creek	3.7	0.32	0.20	Dry	0.40	Ephemeral	0.07	Non-wadeable	0.40	Yes
			0.20	Low	0.13	Intermittent	0.93	Wadeable	0.60	No
			0.40	No flow	0.27	Intermittent w/ perennial pools			0	No, stream not flowing
			0.20	Normal	0.20	Perennial				
Pond Creek	1.8	0.29	0.13	Dry	0	Ephemeral	0.07	Non-wadeable	0.33	Yes
			0	Low	0.33	Intermittent	0.93	Wadeable	0.53	No
			0.53	No flow	0.53	Intermittent w/ perennial pools			0.13	No, stream not flowing
			0.33	Normal	0.13	Perennial				
Middle Yegua Creek	4.9	0.46	0.11	Dry	0.04	Ephemeral	0.07	Non-wadeable	0.67	Yes
			0.59	Low	0.11	Intermittent	0.93	Wadeable	0.22	No
			0.11	No flow	0.07	Intermittent w/ perennial pools			0.11	No, stream not flowing
			0.19	Normal	0.78	Perennial				

Table 4. RUAA summary for each stream

Stream Name	Rush-Copperas Creek	Dry Branch	Alarm Creek	Little Green Creek
Segment Number	1222B	1255I	1226H	1226M
Classified	No	No	No	No
Primary Contact	Frequently	Seldom	Seldom	Not observed or reported
Sec. Contact Rec. 1	Frequently	Seldom	Seldom	Not observed or reported
Sec. Contact Rec. 2	Frequently	Seldom	Seldom	Not observed or reported
Non-Contact	Frequently	Seldom	Seldom	Not observed or reported
Avg Thalweg (m)	0.52	0.03	0.11	0.52
Subst pools > 1m	Yes	No	No	Yes
Gen Public Access	Moderate	Very Limited	Very Limited	Moderate
PDSI	Mid-range	Mid-range	Mid-range	Mid-range

Stream Name	Camp Creek	Trimmier Creek	Deer Creek	Pond Creek	Middle Yegua Creek
Segment Number	1204A	1216A	1242J	1242F	1212A
Classified	No	No	No	No	No
Primary Contact	Frequently	Seldom	Frequently	Frequently	Frequently
Sec. Contact Rec. 1	Frequently	Frequently	Frequently	Frequently	Frequently
Sec. Contact Rec. 2	Frequently	Frequently	Frequently	Frequently	Frequently
Non-Contact	Frequently	Frequently	Frequently	Frequently	Frequently
Avg Thalweg (m)	0.19	0.52	0.32	0.29	0.46
Subst pools > 1m	Yes	Yes	Yes	Yes	Yes
Gen Public Access	Very Limited	Moderate	Moderate	Moderate	Moderate
PDSI	Mid-range	Mod. Drought	Mod. Drought	Mod. Drought	Mod. Drought

Observations and Evidence of Recreational Use and Surrounding Conditions that Promote and Impede Recreation

Primary contact recreational activities were not observed during the field surveys conducted for this 2012 RUAA at any of the streams. Two secondary contact recreational activities were recorded. Three people were observed releasing a turtle into Trimmier Creek. Five people were observed recreating at a public park along Rush-Copperas Creek. Recreational activities included adults walking and children playing in a playground next to the creek

Seven indications of human use (IHU) related to primary contact were recorded on 4 out of 9 streams (Table 5). One inner tube was found on Rush-Copperas Creek at site 1222B.16. One old pair of swimming trunks was found on Alarm Creek at site 1226H.2. One inner tube was found on Deer Creek at site 1242J.2. On Middle Yegua Creek, one rope swing and associated ladder (positioned to be used to climb out of the stream) were found at site 1212A.22. Another rope swing was found at site 1212A.30. A rope for climbing up the bank was found at site 1212A.23.

IHUs related to secondary contact 1 recreation activities were found on all streams except for Little Green Creek. On Rush-Copperas Creek, one child's toy was found along the bank at site 1222B.20 (Table 5). Twenty five indications of fishing were found on the stream including boats (2), fishing tackle (4), and drop lines (19) (Table 6). Eighteen of these were found at site 1222B.15. One fishing reel was found in the creek bed at site 1255I.2 on Dry Branch. On Alarm Creek, 1 child's toy was found along the bank at site 1226H.1. One boat and 1 occurrence of fishing tackle were found at site 1226H.4. One occurrence of fishing tackle was also found at site 1226H.6. One occurrence of fishing tackle was the only indication of human use found on Camp Creek. Trimmier Creek had 18 indications of fishing that were found at 3 survey sites including fishing tackle (10), drop lines (2), bait containers (4), a fishing rod, and a crawfish trap. Twelve of these were found at site 1216A.5. Multiple children's toys (dolls) and a small fort made of rocks were found at site (1242J.2) on Deer Creek. Five indications of fishing were also found at 3 survey sites on the stream including fishing tackle (3), and bait containers (2). On Pond Creek, 6 indications of fishing were found at 4 survey sites including fishing tackle (3), one drop line, one bait containers, and one fishing reel. Middle Yegua Creek had the largest number IHUs related to secondary contact 1 recreation. Remnants of kid's play (flip flops) were found at site

1212A.11. One hundred and sixteen indications of fishing were found at 27 survey sites including fishing tackle (61), drop lines (31), bait containers (21), a fishing net, a rod holder, and a boat. Twenty six, 18, 13, and 12 of these were found at sites 1212A.13, 1212A.11, 1212A.23, and 1212A.14, respectively.

IHUs found at survey sites related to structural amenities and access are presented in Table 7. Chairs next to the stream, ladders, barbeque grills, fire pits, and houses were included in structural amenities. IHU related to access included foot prints and paths, gates, mowed banks, ropes to access the stream, steps, vehicle tracks, and roads. Overall, Middle Yegua Creek had the largest number recorded (both categories combined) (13) followed by Camp Creek (6), Deer Creek (5), Trimmier Creek (4), Rush-Copperas Creek (4), Alarm Creek (3), Pond Creek (3), and Dry Branch (2). Little Green Creek had no recorded observations in these categories.

Miscellaneous IHUs (primarily relating to non-contact recreation activities) including indications related to firearms and hunting, graffiti, empty beverage bottles, dog toys, fire sites, shovels, and cars are presented in Table 8. Middle Yegua Creek had the largest number recorded (21), followed by Deer Creek (10), Rush-Copperas Creek (8), Pond Creek (6), Camp Creek (2), and Trimmier Creek (1). No observations were recorded for Dry Branch, Alarm Creek, or Little Green Creek.

Few surroundings conditions (SC) that promote primary and secondary contact 1 recreation activities were recorded in Camp Creek, Deer Creek, Dry Branch, Middle Yegua Creek, Rush-Copperas Creek, and Trimmier Creek (Table 9). SC that promote primary contact recreational activities included topographic characteristics of the stream bed such as a flat bedrock area and a rock outcropping, as well as hydrological modifications such as a large impoundment. SC that promote secondary contact 1 recreation activities included stream characteristics such as deep fishing pools and holes, as well as fishing lodges and boat ramps (Table 9). Amenities and other factors that promote recreational activities were frequently recorded in all streams (Table 10). Middle Yegua Creek had the highest frequency of amenities and factors that promote recreation (59), followed by Rush-Copperas Creek (28), Deer Creek (28), and Pond Creek (27). Commonly recorded amenities and factors that promote recreation include trails/paths for hiking/biking, unimproved parking lots, paved and unpaved roads, and bridge crossings (Table 10). Surrounding conditions related to the stream bank that promote recreational activities were

frequently observed in all streams, except Alarm Creek and Little Green Creek (Table 10). Middle Yegua Creek had the highest frequency of stream bank conditions that promote recreation (54), followed by Deer Creek (27) and (Rush-Copperas Creek (15). Commonly recorded stream bank conditions that promote recreational activities included natural surroundings and corridors and abundant wildlife (Table 9).

Surrounding conditions that impede recreation were separated into the categories of no access, warning signs, obstacles, and other (Table 11). *No public access* was recorded as a factor impeding recreation in all streams. Lack of public access was more frequently recorded in Middle Yegua Creek (12), Alarm Creek (7), and Pond Creek (5). Warning signs, mostly for *private property*, were also frequently recorded as factors impeding recreation in all streams. Warning signs were more frequently recorded in Middle Yegua Creek (26), Pond Creek (15), Rush-Copperas Creek (13), and Deer Creek (12). Obstacles and other SC that impede recreation were recorded for all nine streams. Common obstacles and other SC that impede recreation included fences, steep slopes, and thick vegetation, as well as poor water quality, no water, or low water levels at the time of survey (Table 11).

Channel obstructions (CO) were recorded in all streams (Table 12). Middle Yegua Creek had the highest frequency of CO (45), followed by Pond Creek (20), Deer Creek (15), and Rush-Copperas creek (14). Log jams, fences, and culverts were the most frequently recorded channel obstructions (Table 12).

Table 5. Indications of Human Use (IHU) recorded during field surveys related to primary contact and secondary contact 1 activities. The presence/absence of each IHU was recorded at each survey site. Values represent the sum of these records for each stream.

	Rush- Copperas Creek	Dry Branch	Alarm Creek	Little Green Creek	Camp Creek	Trimmier Creek	Deer Creek	Pond Creek	Middle Yegua Creek
IHU related to primary contact									
Inner tube (1222B.16 & 1242J.2)	1						1		
Rope swings (1212A.22 & 1212A.30)									2
Ladder next to rope swing (1212A.22)									1
Old swim trunks (1226H.2)			1						
Sub Total	1	0	1	0	0	0	1	0	3
IHU related to secondary contact 1									
Toys (1222B.20, 1226H.1, 1242J.2)	1		1				1		
Child construction (1242J.2)							1		
Remnants of Kid's play (1212A.11)									1
Rope for climbing bank (1212A.23)									1
Sub Total	1	0	1	0	0	0	2	0	2
Total	2	0	2	0	0	0	3	0	5

Table 6. Fishing tackle and equipment found relating to secondary contact 1 activities. Values represent the actually number of separate items found at each survey site. Photographs were taken of all items. The Fishing tackle category includes fishing line, fishing lures, weights, and/or bobbers.

Stream	Survey Site	Fishing tackle	Drop line	Bait container	Rod or reel	Crawfish trap/net	Rod Holder	Boat	Site Total	Stream Total
Rush Copperas Creek	1222B.7		1						1	
Rush Copperas Creek	1222B.12		2					1	3	
Rush Copperas Creek	1222B.13		1						1	
Rush Copperas Creek	1222B.15	3	14					1	18	
Rush Copperas Creek	1222B.19	1	1						2	25
Dry Branch	1255I.2				1				1	1
Alarm Creek	1226H.4	1						1	2	
Alarm Creek	1226H.6	1							1	3
Camp Creek	1204A.6	1							1	1
Trimmier Creek	1216A.2					1			1	
Trimmier Creek	1216A.4	3		1	1				5	
Trimmier Creek	1216A.5	7	2	3					12	18
Deer Creek	1242J.12	1							1	
Deer Creek	1242J.13			2					2	
Deer Creek	1242J.16	2							2	5
Pond Creek	1242F.12	1		1					2	
Pond Creek	1242F.13	1							1	
Pond Creek	1242F.15	1			1				2	
Pond Creek	1242F.6		1						1	6

Table 6 Continued.

Stream	Survey Site	Fishing tackle	Drop line	Bait container	Rod or reel	Crawfish trap/net	Rod Holder	Boat	Site Total	Stream Total
Middle Yegua Creek	1212A.7	5	1	1			1		8	
Middle Yegua Creek	1212A.9	1	4						5	
Middle Yegua Creek	1212A.11	10	2	6					18	
Middle Yegua Creek	1212A.12	1	4						5	
Middle Yegua Creek	1212A.13	17	4	5					26	
Middle Yegua Creek	1212A.14	7	3	1				1	12	
Middle Yegua Creek	1212A.15	4	3	3					10	
Middle Yegua Creek	1212A.16	1	4						5	
Middle Yegua Creek	1212A.20		1						1	
Middle Yegua Creek.	1212A.23	6	3	3		1			13	
Middle Yegua Creek	1212A.29	2		1					3	
Middle Yegua Creek	1212A.30	7	2	1					10	116

Table 7. Indications of human use (IHU) recorded during field surveys related to structural amenities and access. The presence/absence of each IHU was recorded at each survey site. Values represent the sum of these records for each stream.

	Rush- Copperas Creek	Dry Branch	Alarm Creek	Little Green Creek	Camp Creek	Trimmier Creek	Deer Creek	Pond Creek	Middle Yegua Creek
IHU related to structural amenities									
Chair next to stream							1		
Viewing chairs						1			
Wooden ladder in tree					1				
Grill			1						
Fire pit/ring	1					1			2
House			1						
Sub Total	1	0	2	0	1	2	1	0	2
IHU related to access									
Foot paths/prints	2				1	1	2		5
Gates on corridor					1				
Mowed banks						1			
Rope for climbing up to bank									1
Steps cut into hillside								1	
Well-trodden area near bridge and water								1	
RV/ATV Tracks			1		3		2	1	1
Tire tracks on impoundment		1							
Tire tracks	1	1							2
Roads								1	1
Sub Total	3	2	1	0	5	2	4	3	11
Total	4	2	3	0	6	4	5	3	13

Table 8. Miscellaneous Indications of Human Use (IHU) recorded during field surveys. The presence/absence of each IHU was recorded at each survey site. Values represent the sum of these records for each stream.

	Rush- Copperas Creek	Dry Branch	Alarm Creek	Little Green Creek	Camp Creek	Trimmier Creek	Deer Creek	Pond Creek	Middle Yegua Creek
Miscellaneous IHU									
Ammunition								1	
Bullet casings							1		
Firearm remnants						1			
Shotgun shell(s)	1				1		4	2	4
Shooting range	1								
Deer feeder					1		1		2
Hunting tree stand									1
Old hunting stand	1								
Trap for hunting									3
Hunting Arrow							1		
Hunting remnants								1	
Graffiti	4						1		7
Marked trees									1
Clusters of beers cans								2	1
Water bottles									1
Dog toy							1		
Fire site									1
Hand shovel							1		
Car near the stream	1								
Total	8	0	0	0	2	1	10	6	21

Table 9. Surrounding conditions (SC) that promote primary and secondary contact 1 recreation recorded during field surveys for each stream. The presence/absence of each SC was recorded at each survey site. Values represent the sum of these records for each stream.

	Rush- Copperas Creek	Dry Branch	Alarm Creek	Little Green Creek	Camp Creek	Trimmier Creek	Deer Creek	Pond Creek	Middle Yegua Creek
Surrounding conditions that promote primary contact activities									
Large flat bedrock area	1								
Rock outcropping	1								
Large impoundment		1							
Subtotal	2	1	0	0	0	0	0	0	0
Surrounding conditions that promote secondary contact-1 activities									
Deep hole near bridge									1
Substantial pool with fish					1				
Old fishing lodge, as designated by adjacent landowner							1		
Boating access ramps						1	1		
Subtotal	0	0	0	0	1	1	2	0	1
Total	2	1	0	0	1	1	2	0	1

Table 10. *Surrounding conditions that promote all types of recreation recorded during field surveys for each stream.*

	Rush- Copperas Creek	Dry Branch	Alarm Creek	Little Green Creek	Camp Creek	Trimmier Creek	Deer Creek	Pond Creek	Middle Yegua Creek
Amenities									
Stairs/walkway									1
Trails/paths hiking/biking	2					1	3		4
Parks national/city/county/state	1					1			1
Sports Field	1								
Playgrounds	1								
Campgrounds									1
Picnic table, swing, and deck						1			
Swing set						1			
Public property	1					1			
Unimproved parking lot	2						1		2
Bridge crossing	4		1	3		3	8	12	19
Roads paved/unpaved	4		2	3	2		1		4
Homes adjacent to stream	1								
Residential area						1			
Urban/suburban location	2					1			
Rural area	9	2	4	3	5	3	15	15	27
Subtotal	28	2	7	9	7	13	28	27	59
Condition of stream bank									
Beach	1					1			
Natural surroundings/corridor	7	1			4	3	15	4	26
Low water crossing									1
Mowed corridor that straddles HW and leads to the stream banks								2	
Pleasant landscape									1
Wild fruit									1
Wildlife	7				2		12	1	25
Subtotal	15	1	0	0	6	4	27	7	54
Total	43	3	7	9	13	17	55	34	113

Table 11. Characteristics that impede recreation recorded during field surveys for each stream.

	Rush- Copperas Creek	Dry Branch	Alarm Creek	Little Green Creek	Camp Creek	Trimmier Creek	Deer Creek	Pond Creek	Middle Yegua Creek
No access									
No public access	4	2	7	3	4	2		5	12
No roads							1		
Sub total	4	2	7	3	4	2	1	5	12
Warning signs									
No trespass sign									2
Private Property	13	2	7	3	5	4	12	15	24
Sub total	13	2	7	3	5	4	12	15	26
Obstacles									
Fence	11	2	5	2	3	1	11	5	20
Bard wire fence remains				1					
Low hanging power or phone cable								1	
Thick vegetation	1	1					1		3
Steep slopes	4		2	3	2		14	7	17
Sub total	16	3	7	6	5	1	26	13	40
Other									
No water at time of survey	3		3				4	3	2
Low water level in channel									1
No flow at time of survey	3	2	1		2		8	6	4
NPDES Discharge							1		
Drain Pipe					1				
Cattle/ Cattle droppings	3	1							1
Poor water quality	2						1		
Broken glass in channel								1	
Algae/Duckweed			2	1	1				
Sub total	11	3	6	1	4	0	14	10	8
Total	44	10	27	13	18	7	53	43	86

Table 12. Channel obstructions recorded during field surveys for each stream.

	Rush- Copperas Creek	Dry Branch	Alarm Creek	Little Green Creek	Camp Creek	Trimmier Creek	Deer Creek	Pond Creek	Middle Yegua Creek
Culverts	2		2	1	3	2		2	4
Dams	2								1
Low bridges	2			2					2
Concrete bridge pillars								2	
Old metal bridge			1						
Rip rap						1		1	2
Fences	4	1			2	1	3	4	8
Log jams	3		3	1	1		10	7	24
Tree roots			1						
Tree		1		1					
Large rocks				1					
Thick vegetation	1	1				1		1	1
Wire cable						2			2
Pipe									1
Utility pipe							1	3	
Sign indicating a gas pipe in riparian area							1		
Total	14	3	7	6	6	7	15	20	45

Recreational Use Interviews

Unclassified water body 1222B (Rush-Copperas Creek):

Thirty nine recreational use interviews were conducted in the Rush-Copperas Creek area. Most of the interviews were conducted in person (87%) by two field technicians, while a few interviews (13%) were conducted over the phone by one technician. The majority of the interviewees were selected because they own land adjacent to the stream (41%) or are local residents that live near the stream (31%). Other interviewees were selected because the stream is adjacent to their house (23%) or runs throughout their property (5%). One landowner with property adjacent to the stream was unwilling to complete the interview (Fig. 1).

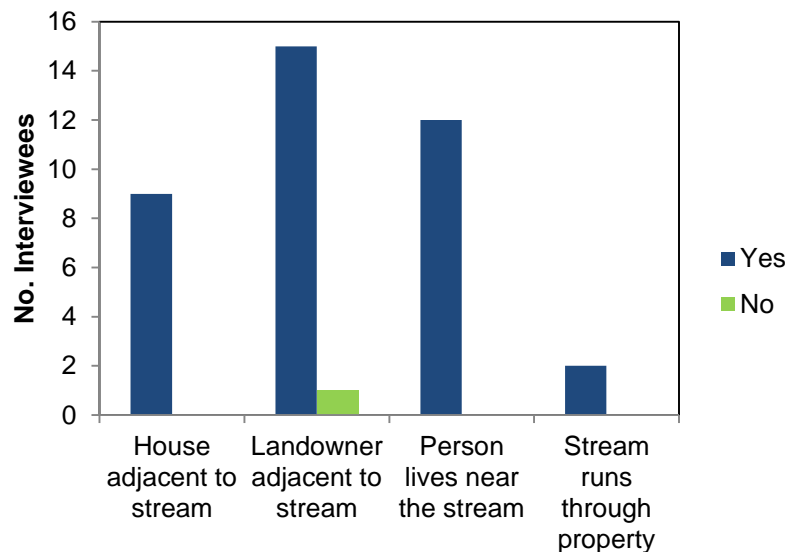


Figure 1. Number of interviewees that participated in interviews assessing recreation in Rush-Copperas Creek (Water body 1222B). Categories represent the reason why interviewees were selected. Yes/No indicates whether interviews were completed.

The majority of people that were interviewed have been familiar with the water body for 50 or more years (34%, Table 13). Three of the interviewees were unfamiliar with the stream. These interviews were excluded from further results bringing the total number of completed interviews to 35. Most interviewees classified the stream as intermittent with perennial pools or ephemeral (Table 14).

Table 13. Number of years interviewees have been familiar with Rush-Copperas Creek (Water body 1222B) (n = 38).

No. of Years Familiar	Percentage of Interviewees
≤ 5	5%
$5 - < 10$	18%
$10 - < 20$	16%
$20 - < 50$	18%
≥ 50	34%
Unfamiliar with stream	8%

Table 14. Stream classification by interviewees which are familiar with portions of Rush-Copperas Creek (Water body 1222B) (n = 35).

Classification	Percentage of Interviewees
Ephemeral	29%
Intermittent	23%
Intermittent w/ perennial pools	34%
Perennial	11%
Unable to classify	3%

More than half of the people that participated in the interviews and their families use Rush-Copperas Creek for recreation (63%). Among the interviewees that use the stream for recreation, 36% engage in primary contact recreation activities, while 77% engage in secondary contact 1 recreation activities (Table 15).

All age classes (adults, children, and teenagers) were reported, with approximately equal frequency, in recreation activities at Rush-Copperas Creek (Water body 1222B) involving the interviewee and his/her family (Fig. 2). Over half of the interviewees that recreate in Rush-

Copperas Creek use the stream between 1 to 30 days per year (55%, average = 4 ± 2 days/year), 18% use the stream between 30 to 180 days per year (average = 110 ± 14 days/year), and 14% use the stream more than 180 days per year (average = 203 ± 5 days/year). Three interviewees did not specify frequency of use per year. Among the interviewees that specifically stated using the stream for primary contact recreation activities (i.e. swimming, tubing, and wading children), 50% reported using the stream for over 50 years, while 25% have used the stream for nearly 30 years. Recreation in Rush-Copperas Creek occurs in all seasons.

Table 15. Recreational activities reported in Rush-Copperas Creek (Water body 1222B) that involve the person that was interviewed and or his/her family. Note that a single interviewee can report one or more recreational activities.

Personal or Family Uses	Number of Reports
Primary Contact Recreation Activities	
Swimming	8
Tubing	1
Wading - Children	1
Secondary Contact Recreation Activities	
Children playing on shore or banks and in stream bed	3
Wading - Adults	2
Fishing (For consumption)	10
Fishing (Catch and release)	4
Other (Crawdad fishing)	1
Noncontact Recreation Activities	
Camping	3
Hunting	5
Other (Artifact hunting)	1
Other (Fossil hunting)	1
Other (Rock/Mineral hunting)	1
Watching wildlife or nature	1
Other (Children and teenagers throw rocks, ride bikes, and look for snakes in the dry creek bed)	1
Other (Hiking/walking)	1
Other (ATV)	1
Other (Use a gun range on the property)	1
Playing on shore or banks	1

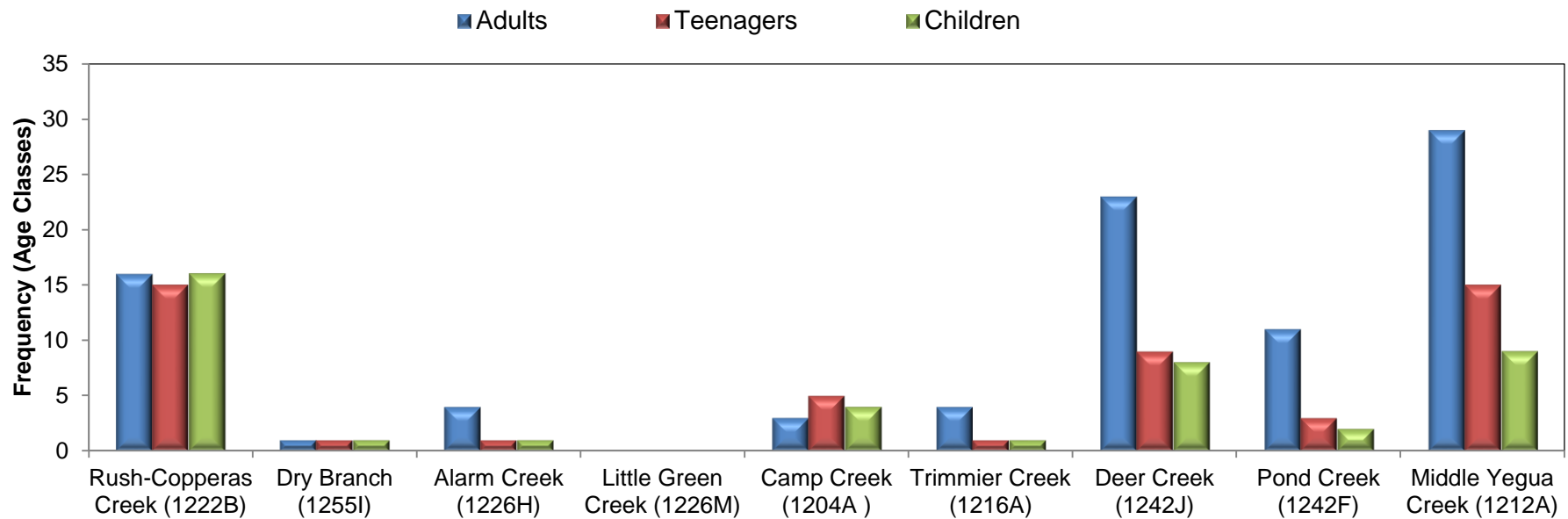


Figure 2. Age class frequencies of people participating in recreational activities per water body. Recreational activities involved the person that was interviewed and her/his family.

Most of the interviewees that do not use the stream for recreation have other personal interests (62%). Other reasons given for not using the stream were related to physical characteristics of the stream (i.e., low water level, water quality, and thick vegetation), lack of access due to the stream being on private property, and potentially dangerous wildlife (snakes) (Table 16).

Table 16. Reasons stated by interviewees for not using Rush-Copperas Creek (Water body 1222B). Percentages are based on 13 people that stated not using the stream. Note that a single interviewee can report one or more reason for not using the stream for recreation.

Reasons for Not Using the Stream	Percentage of Interviewees
Other personal interests (Do not Specify)	62%
Physical characteristics (Low or No water)	15%
Physical characteristics (Thick vegetation)	8%
Physical characteristics (Water quality)	8%
Stream is on private property and cannot access	8%
Potentially dangerous wildlife (Snakes)	8%

Interviewees have witnessed a variety of recreational activities currently occurring in Rush-Copperas Creek (Table 17). These activities included primary contact recreation (i.e., swimming and children playing in the stream) and secondary contact recreation (i.e., children playing on shore or banks and in stream, fishing, and boating). The most frequently witnessed activities were fishing for consumption and boating. Witnessed recreation activities involved mostly adults (32% of cases), but teenagers (21%) and children (21%) were also observed recreating. Several cases of witnessed recreation involved people of all ages (26%). Thirty seven percent of interviewees have not witnessed recreation in Rush-Copperas Creek.

Table 17. Recreational activities in Rush-Copperas Creek (Water body 1222B) witnessed by interviewees. Note that a single interviewee may report witnessing one or more recreational activities.

Witnessed Recreational Activities	Number of Reports
Primary Contact Recreation Activities	
Swimming	4
Children playing in stream	1
Secondary Contact Recreation Activities	
Children playing on shore or banks	1
Boating	5
Fishing (For consumption)	16
Fishing (Catch and release)	2
Noncontact Recreation Activities	
Children walk and play in dry creek bed	1
Camping	2
Hunting	1
Other (Artifact hunting)	1

Interviewees also reported hearing of a variety of recreational activities occurring in Rush-Copperas Creek (Table 18). These activities included primary contact recreation (i.e., swimming, tubing, and cliff diving) and secondary contact recreation (i.e., fishing and boating). The most frequent recreational activity that people have heard of occurring in the stream was fishing for consumption. Recreational activities that interviewees have heard of involved mostly adults (42% of cases), but teenagers (23%), and in few instances children (8%), have also been heard of recreating in the stream. Several cases of recreational activities that interviewees have heard of involved people of all ages (27%). Thirty four percent of interviewees have not heard of recreation occurring in Rush-Copperas Creek.

Table 18. Recreational activities that interviewees have heard of occurring in Rush-Copperas Creek (Water body 1222B). Note that a single interviewee can report hearing of one or more recreational activities.

Recreational Act. Heard of Occurring in the Stream	Number of Reports
Primary Contact Recreation Activities	
Swimming	3
Tubing	1
Other (Cliff diving)	1
Secondary Contact Recreation Activities	
Boating	2
Fishing (For consumption)	7
Fishing (Catch and release)	2
Fishing from leasing hunters	1
Noncontact Recreation Activities	
Camping	1
Picnicking	1
Hunting	7
Other (Artifact hunting)	1
Other (Watering cattle)	1
Other (Weddings on the rocks)	1

Nearly half of the interviewees stated that recreational activities in Rush-Copperas Creek have changed through time (51%). Some of the most frequently stated reasons for changes in recreational use were changes in water level, changes in culture and personal interests, changes in the physical characteristics associated with lake or dam constructions, and restricted access after land was sold to a new owner (Fig. 3).

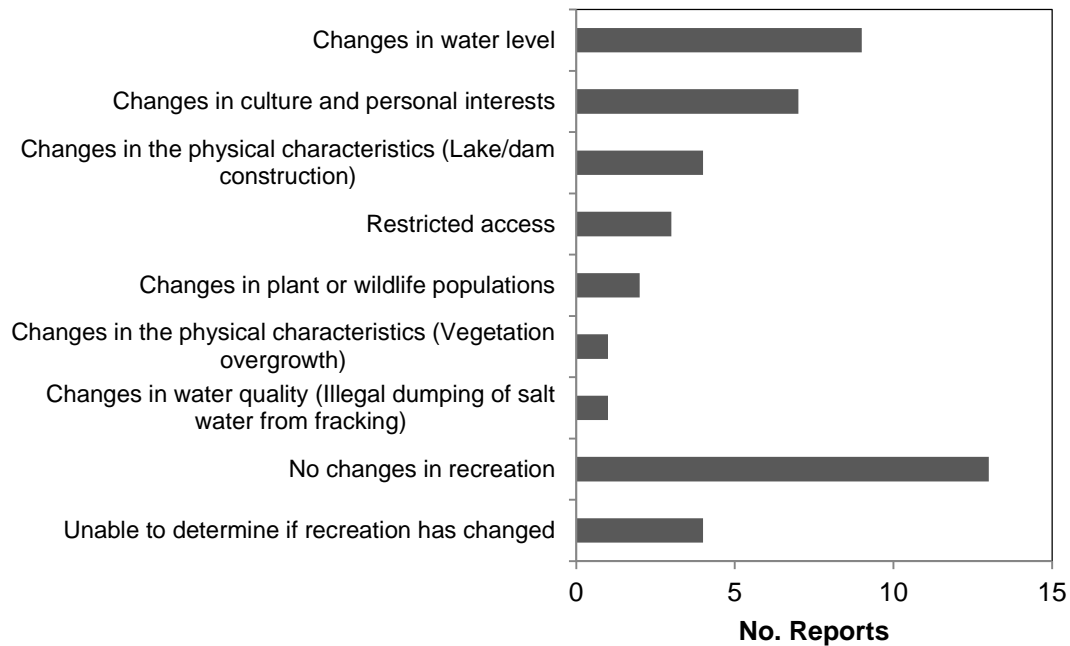


Figure 3. Reasons stated by interviewees for changes in recreational activities in Rush-Copperas Creek (Water body 1222B). Note that a single interviewee can state one or more reasons for change in recreational activities.

Recreational activities that characterized Rush-Copperas Creek (Water body 1222B) in the past include primary contact activities (i.e. swimming and wading by children) (Table 19). These primary contact activities are still occurring in the stream in the present time, although with slightly less frequency (Table 15, 17, and 18). Some of the main reasons stated by interviewees for this decrease in primary contact were lower water levels than in the past (e.g., one interviewee stated that “the completion of a lake modified stream flow”, Site ID: 1222B.7; another interviewee said that “one of his/her neighbors claims the stream never dried up her entire life”, Site ID: 1212B.16; another interviewee said that “there is not as much water as there used to be”, Site ID: 1222B.17), lack of access (e.g., one interviewee stated that “other people have bought commonly used land around the stream and restricted access”, Site ID: 1222B.15; similarly another interviewee stated that “when a neighboring landowner moved in, he limited the amount of recreation taking place on his land”, Site ID:1222B.13), and changes in culture and personal interests.

Table 19. Recreational activities that characterized Rush-Copperas Creek (Water body 1222B) in the past.

Recreational Activities	Past
Primary Contact Recreation Activities	
Swimming	11
Wading - Children	2
Secondary Contact Recreation Activities	
Children playing on shore or banks and in stream bed	2
Wading - Adults	2
Playing on shore or banks and/or and in stream bed	4
Fishing (Catch and release)	5
Fishing (For consumption)	10
Other (Crawdada fishing)	1
Boating	2
Other (Jet Skiing)	1
Other (Washing cars)	1
Noncontact Recreation Activities	
Camping	4
Picnicking	1
Hiking/walking	2
Other (Artifact hunting)	1
Other (Fossil hunting)	1
Other (Rock/Mineral hunting)	0
Watching wildlife or nature	0
Hunting	3
Trapping	1
Other (ATV)	0
Other (Use a gun range on the property)	0
Other (Baptisms)	1

Unclassified water body 1255I (Dry Branch):

Five recreational use interviews were conducted in the Dry Branch area. All of these interviews were conducted in person by two field technicians. Two of the interviewees were selected because they own property adjacent to the stream and live there. Two other interviewees were selected because they live near the stream. The last interviewee is a worker at a golf course adjacent to the stream. Three of the interviewees have been familiar with the stream for over 30 years (average 41 ± 11 years). The golf course worker has been familiar with the stream for only 3 months. One of the interviewees was unable to determine how long he/she has been familiar with the stream. Two people classified the stream as ephemeral, two as intermittent, and one as intermittent with perennial pools.

Three of the interviewees do not use the stream. Reasons for not using the stream were low water levels or no water in the stream. One person, who has a large impoundment in the middle of his/her property, uses the stream for swimming, kayaking, boating, canoeing, fishing, and hunting. All age classes (adults, teenagers, and children) are involved in these recreational activities. These activities have been occurring during the spring and summer since 1978 to the present. The golf course worker picks golf balls out of the stream.

None of the people interviewed have witnessed or heard of recreational activities occurring in Dry Branch. One of the interviews stated that “people used to fish in the stream, but no one has used the stream in a long time due to lack of water in the stream” (Site ID: 1255I.4). Another interviewee stated that “the stream is located on private property and the landowner does not let anyone recreate on stream. Also, there is not enough water for recreation” (Site ID: 1255I.2).

Unclassified water body 1226H (Alarm Creek):

Twelve recreational use interviews were conducted in the Alarm Creek area. All of the interviews were conducted in person by two field technicians. Most interviewees were selected because the stream crossed their property (64%). Other interviewees were selected because they are local residents that own houses adjacent to (18%) or near to the stream (18%) (Fig. 4).

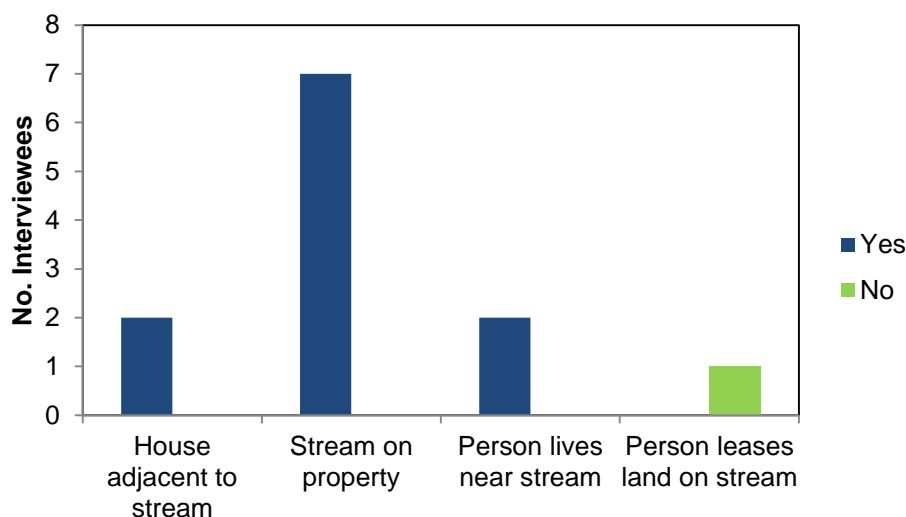


Figure 4. Number of interviewees that participated in interviews assessing recreation in Alarm Creek (Water body 1226H). Categories represent the reason why interviewees were selected. Yes/No indicates whether interviews were completed.

The majority of the people that were interviewed have been familiar with the water body for a period between 5 and 10 years (33%, Table 20). Most of these people classified the stream as ephemeral or intermittent with perennial pools (Table 21). One person that leases land on the stream was unwilling to finish the interview. This interview was excluded from further results.

Table 20. Number of years interviewees have been familiar with Alarm Creek (Water body 1226H) (n = 12).

No. of Years Familiar	Percentage of Interviewees
≤ 5	25%
5 – < 10	33%
10 – < 20	0%
20 – <50	25%
≥ 50	8%

Table 21. Stream classification by interviewees which are familiar with portions of Alarm Creek (Water body 1226H) (n = 12).

Classification	Percentage of Interviewees
Ephemeral	58%
Intermittent	8%
Intermittent with perennial pools	25%
Perennial	0%
N/A	8%

Currently, less than half of the people that participated in the interviews and their families use Alarm Creek for recreation (36%). Only secondary contact 1 and non-contact recreational activities were reported as occurring in Alarm Creek (Table 22). One of the interviewees (Site ID 1226H.6) however, reported that children (including kids in his/her family) used to wade and swim in the stream until the water quality deteriorated after a dairy farm opened upstream and there was a lot of runoff into the creek. Another interviewee (Site ID 1226H.5) stated that he/she used to have swimming holes in his/her property, but it has been dry for years. In the 80's his/her children used to swim in the stream during the spring and summer months.

Table 22. Recreational activities reported in Alarm Creek (Water body 1226H) that involve the person that was interviewed and or his/her family. Note that a single interviewee can report one or more recreational activities.

Personal or Family Uses	Number of Reports
Secondary Contact Recreation Activities	
Boating	1
Fishing	2
Fishing (Catch and release)	1
Noncontact Recreation Activities	
Hunting	1

Adults, was the age class most frequently reported in recreational activities in Alarm Creek involving the interviewee and his/her family (Fig. 2). None of the interviewees that use the stream for recreation gave specific information regarding number of days per year of use. Among the interviewees that specifically stated using the stream for secondary contact recreation activities (i.e. fishing and boating), 25% reported using the stream for over 40 years, while 75% reported using the stream for the last 5 years. Recreation in Alarm Creek was reported to occur in all seasons.

Most of the interviewees that do not use the stream for recreation stated that the water level was too low for recreation. Other reasons given for not using the stream were related to water quality (water is muddy or polluted), lack of access due to the stream being on private property, and potentially dangerous wildlife (snakes) (Table 23).

Table 23. Reasons stated by interviewees for not using Alarm Creek (Water body 1226H). Percentages are based on 7 people that stated not using the stream. Note that a single interviewee can report one or more reason for not using the stream for recreation.

Reasons for Not Using the Stream	Percentage of Interviewees
Physical characteristics (Low or No water)	57%
Physical characteristics (Poor water quality)	29%
Potentially dangerous wildlife (Snakes)	14%
Other (Stream located on private property)	14%
Other personal interests (Stream not on property. Not very interested)	14%

None of the people interviewed have witnessed recreational activities occurring in Alarm Creek. One of the interviewees (Site ID 1226H.1) has heard of adults hunting downstream on neighboring property during the hunting season. Another interviewee (Site ID 1226H.1) stated hearing of a fishing tank upstream of his/her property.

Unclassified water body 1226M (Little Green Creek):

Only one recreational use interview was conducted in the Little Green Creek area. This interview was conducted in person by two field technicians. The interviewee was selected because the stream runs throughout his property. This person has been familiar with the stream on his property for the last 21 years. The interviewee classified the stream as intermittent with perennial pools. This person and his family do not use Little Green Creek for recreation due to the low water level or lack of water in the stream. The interviewee has not witnessed or heard of recreational activities occurring in Little Green Creek currently or in the past. The interviewee commented that his property is used for hunting, but no one uses the stream for anything in particular.

Unclassified water body 1204A (Camp Creek):

Nine recreational use interviews were conducted in the Camp Creek area. All of the interviews were conducted in person by two field technicians. The interviewees were selected because their houses are adjacent to the stream (56%) or because they live near the stream (44%).

Most of the interviewees have been familiar with the water body for 50 or more years (67%) (Table 24). One of the interviewees was unfamiliar with the stream. This interview was excluded from further results bringing the total number of completed interviews to eight. Most interviewees classified the stream as intermittent with perennial pools (Table 25).

Table 24. Number of years interviewees have been familiar with Camp Creek (Water body 1204A) (n = 9).

No. of Years Familiar	Percentage of Interviewees
≤ 5	11%
5 – < 10	0%
10 – < 20	0%
20 – < 50	11%
≥ 50	67%
Unfamiliar with stream	11%

Table 25. Stream classification by interviewees which are familiar with portions of Camp Creek (Water body 1204A) (n = 8).

Classification	Percentage of Interviewees
Ephemeral	0%
Intermittent	13%
Intermittent w/ perennial pools	63%
Perennial	13%
Information not collected	13%

More than half of the people that participated in the interviews and their families use Camp Creek for recreation (63%). Among the interviewees that use the stream for

recreation, half engage in primary contact recreation activities, while 100% engage in secondary contact 1 recreation activities (Table 26).

Table 26. Recreational activities reported in Camp Creek (Water body 1204A) that involve the person that was interviewed and his or her family. Note that a single interviewee can report one or more recreational activities.

Personal or Family Uses	Number of Reports
Primary Contact Recreation Activities	
Swimming	3
Rafting (small pool style raft used as a swim aid)	1
Wading - Children	3
Secondary Contact Recreation Activities	
Wading - Adults	2
Fishing (For consumption)	2
Fishing (Catch and release)	1
Noncontact Recreation Activities	
Camping	2
Picnicking	1
Playing on shore or banks	2

Mostly teenagers and children of the interviewee's family carry out recreational activities in Camp Creek (Fig. 2). Two of the interviewees and their families use the stream for recreation between 1 to 30 days per year. Another family uses the stream for recreation between 30 to 90 days per year. Frequency of use of the stream for recreation was not recorded for the other two interviewees. Three families have been using the stream for primary contact since the 1940's (i.e., over 60 years). One of these families (Site ID 1204A.5) has stopped using the stream within the last 5 years because oil companies have built several roads through the stream improperly, which has increased sedimentation and reduced water clarity. Recreation in Camp Creek occurs throughout the spring, summer, and fall.

Two of the interviewees that do not use the stream for recreation have other personal interests. Another interviewee does not use the stream due to low water levels or lack of water in the stream.

Two interviewees have witnessed recreational activities currently occurring in Camp Creek. Witnessed primary contact recreation activities included swimming, tubing, and wading by children. Witnessed secondary contact recreation activities include wading by adults and kayaking. Playing on shore or banks was also witnessed. Witnessed recreational activities involved people of all ages (adults, teenagers, and children). These activities have been occurring during the spring and summer months since the 1950's and 1960's to the present.

Interviewees also reported hearing of recreational activities occurring in Camp Creek (Table 27). These activities included primary contact recreation (i.e., swimming and baptisms) and secondary contact recreation (i.e., fishing). Recreational activities heard of involve people of all ages (adults, teenagers, and children) and have been occurring mostly during the spring and summer months since the 1940's and 1960's to the present. Two interviewees have not heard of recreational activities occurring in Camp Creek. No data regarding recreational activities heard of were collected during one of the interviews.

Table 27. Recreational activities that interviewees have heard of occurring in Camp Creek (Water body 1204A). Note that a single interviewee can report hearing of one or more recreational activities.

Recreational Act. Heard of Occurring in the Stream	Number of Reports
Primary Contact Recreation Activities	
Swimming and Baptisms by a local church	3
Secondary Contact Recreation Activities	
Fishing (For consumption)	2
Noncontact Recreation Activities	
Hunting	3

Half of the interviewees stated that recreational activities in Camp Creek have changed through time. Recreational activities that characterized Camp Creek in the past include primary contact activities (i.e. swimming, rafting (small pool style raft used as a swim aid), and wading by children) (Table 28). These primary contact activities are still occurring in the stream in the present time, although with slightly less frequency (Table 26, 27). Some of the reasons for changes in recreational use were changes in water level

(e.g., one interviewee stated that “water levels in the stream have dropped dramatically because of drying springs within the past 3-4 years as a result of hydrofracking.” The interviewee said that the stream used to be beautiful and always had water in it. This changed as a result of hydrofracking activities depleting groundwater. His argument for this claim was that shortly after hydrofracking began in the area, wells ran dry and all the springs stopped flowing. , Site ID: 1204A.6), changes in water quality (e.g., one interviewee stated that “in the 1970's the lime plant moved closer to the stream [located between 1204A.4 and 1204A.5] and has been responsible for large fish kills downstream of the facility; two interviewees [One between Site ID. 1204A.4 and 1204A.5, and the second near Site ID: 1204A.6] stated that “oil companies have impacted the water quality through the construction of several roads that cross the stream” and “in the past there was more recreation than in the present as a result of negative impacts on the stream from oil companies” ; the second interviewee and their family “no longer recreate within the creek because of the poorly engineered roads that have increased erosion and sedimentation in the stream around their property. The landowner wants the stream to be restored to its condition prior to the oil company road construction areas that negatively impacted the stream so that they can use the stream for primary contact recreation once again.”), and restricted access (e.g., one interviewee stated that “this generation of landowners is not as receptive to letting neighbors and strangers onto their land to use the stream”, Site ID: 1204A.6; another interviewee said that “property owners no longer allow people to freely access the stream to recreate and therefore fewer people are able to use the stream”, Site ID: 1204A.7).

Table 28. Recreational activities that characterized Camp Creek (Water body 1204A) in the past.

Recreational Activities	Past
Primary Contact Recreation Activities	
Swimming	4
Wading - Children	3
Rafting (small pool style raft used as a swim aid)	1
Secondary Contact Recreation Activities	
Canoeing	1
Fishing (For consumption)	2
Wading - Adults	1
Noncontact Recreation Activities	
Camping	1
Hunting	1
Playing on shore or banks	2

Unclassified water body 1216A (Trimmier Creek):

Twelve recreational use interviews were conducted in the Trimmier Creek area. The majority of the interviews were conducted in person (92%) by two field technicians, while one interview was conducted over the phone by one technician. Most of the interviewees were selected because the stream is adjacent to their house (67%) or are landowners with property adjacent to the stream (33%).

People that were interviewed have been familiar with Trimmier Creek for a wide range of time (Table 29). In one of the interviews, the number of years that the person has been familiar with the stream was not obtained. Most interviewees classified the stream as perennial (75%), or intermittent with perennial pools (17%). One interviewee classified the stream as ephemeral.

Table 29. Number of years interviewees have been familiar with Trimmier Creek (Water body 1216A) (n = 12).

No. of Years Familiar	Percentage of Interviewees
≤ 5	8%
5 – < 10	8%
10 – < 20	25%
20 – < 50	25%
≥ 50	25%
Unable to obtain during interview	8%

Thirty three percent of the people that participated in the interviews and their families use Trimmier Creek for recreation. One of the interviewees that uses the stream for recreation allows their children to wade in the stream. Three of the interviewees that use the stream for recreation engage in secondary contact 1 recreation activities including wading by adults (Table 30).

Table 30. Recreational activities reported in Trimmier Creek (Water body 1216A) that involve the person that was interviewed and or his/her family. Note that a single interviewee can report one or more recreational activities.

Personal or Family Uses	Number of Reports
Primary Contact Recreation Activities	
Wading - Children	1
Secondary Contact Recreation Activities	
Fishing (For consumption)	2
Wading - Adults	1
Noncontact Recreation Activities	
Picnicking	3
Playing on shore or banks	1
Watching wildlife or nature	4

Adults were the age class most frequently reported in recreational activities in Trimmier Creek involving the interviewee and his/her family (Fig. 2). The majority of interviewees that recreate in Trimmier Creek use the stream between 1 to 30 days per year (75%, average = 18 ± 3 days/year) and 25% use the stream 60 days per year. The interviewee that specifically stated using the stream for primary contact recreation reported that he/she and his /her family have been using the stream for the last 15 years. Recreation in Trimmier Creek occurs in all seasons.

Half of the interviewees that do not use the stream for recreation said that their families have grown too old to recreate in the stream. Other reasons given for not using the stream for recreation were related to people having other personal interests and the stream having low water levels or no water at all (Table 31).

Table 31. Reasons stated by interviewees for not using Trimmier Creek (Water body 1216A). Percentages are based on 8 people that stated they do not use the stream. Note that a single interviewee can report one or more reason for not using the stream for recreation.

Reasons for Not Using the Stream	Percentage of Interviewees
Changes in demographics	50%
Other personal interests (Do not Specify)	38%
Physical characteristics (Water level)	25%

Interviewees have witnessed a variety of recreation activities currently occurring in Trimmier Creek (Table 32). These activities included primary contact recreation (i.e., swimming) and secondary contact 1 recreation (i.e., fishing and wading by adults). The most frequently witnessed recreational activity was fishing for consumption. Fishing catch and release, picnicking, and playing on shore or banks also were frequently reported as witnessed activities. Witnessed recreation activities involved mostly adults (50% of cases), but teenagers (25%) and children (25%) were also observed recreating. One interviewee has not witnessed recreation in Trimmier Creek. Information on witnessed recreation was not collected during three interviews.

Table 32. Recreational activities in Trimmier Creek (Water body 1216A) witnessed by interviewees. Note that a single interviewee may report witnessing one or more recreational activities.

Witnessed Recreational Activities	Number of Reports
Primary Contact Recreation Activities	
Swimming	1
Secondary Contact Recreation Activities	
Fishing (For consumption)	7
Fishing (Catch and release)	4
Wading - Adults	1
Noncontact Recreation Activities	
Playing on shore or banks	4
Picnicking	4
Hunting	2
Other (ATV)	1
Other (Dog walking)	1
Other (Horseback riding)	1
Other (Watering horses)	1

Interviewees also reported hearing of a variety of recreational activities occurring in Trimmer Creek including primary contact recreation (i.e. swimming) and secondary contact recreation (i.e., fishing) (Table 33). The most frequent recreational activity that people have heard of occurring in the stream was fishing for consumption. Recreational activities that interviewees have heard of involved mostly adults (29% of cases).

Teenagers and children were also reported carrying out heard of recreation in Trimmier Creek by one interviewee. Thirty three percent of interviewees have not heard of recreation occurring in Trimmier Creek. Information of recreation heard of was not collected during four interviews.

Table 33. Recreational activities that interviewees have heard of occurring in Trimmier Creek (Water body 1216A). Note that a single interviewee can report hearing of one or more recreational activities.

<u>Recreational Act. Heard of Occurring in the Stream</u>	<u>Number of Reports</u>
Primary Contact Recreation Activities	
Swimming	1
Secondary Contact Recreation Activities	
Fishing (Catch and release)	3
Fishing (For consumption)	4
Noncontact Recreation Activities	
Playing on shore or banks	1
Picnicking	1
Hunting	3

Half of the interviewees were unable to determine if recreational activities in Trimmier Creek have changed through time. The other half stated that recreational activities in Trimmier Creek have not changed through time. Recreational activities that characterized Trimmier Creek in the past include primary contact recreation (i.e. wading by children, Table 34) which is still occurring in the stream in the present time (Table 30, 32, and 33).

Table 34. Recreational activities that characterized Trimmier Creek (Water body 1216A) in the past.

Recreational Activities	Past
Primary Contact Recreation Activities	
Wading - Children	1
Secondary Contact Recreation Activities	
Fishing (Catch and release)	4
Fishing (For consumption)	4
Wading - Adults	1
Noncontact Recreation Activities	
Hunting	3
Other (ATV)	1
Picnicking	1
Playing on shore or banks	1

Unclassified water body 1242J (Deer Creek):

Forty six recreational use interviews were conducted in the Deer Creek area. Most of the interviews were conducted in person (83%) by two field technicians, while a few interviews (17%) were conducted over the phone by one technician. The majority of the interviewees were selected because they are local residents that live near the stream (44%) or are landowners with property adjacent to the stream (27%). Other interviewees were selected because the stream is adjacent to their house (13%) or runs throughout their property (4%). Other interviewees included relatives of local landowners who are familiar with the stream, a local resident that has recreated at the stream, a local store owner, and a local land manager (Fig. 5).

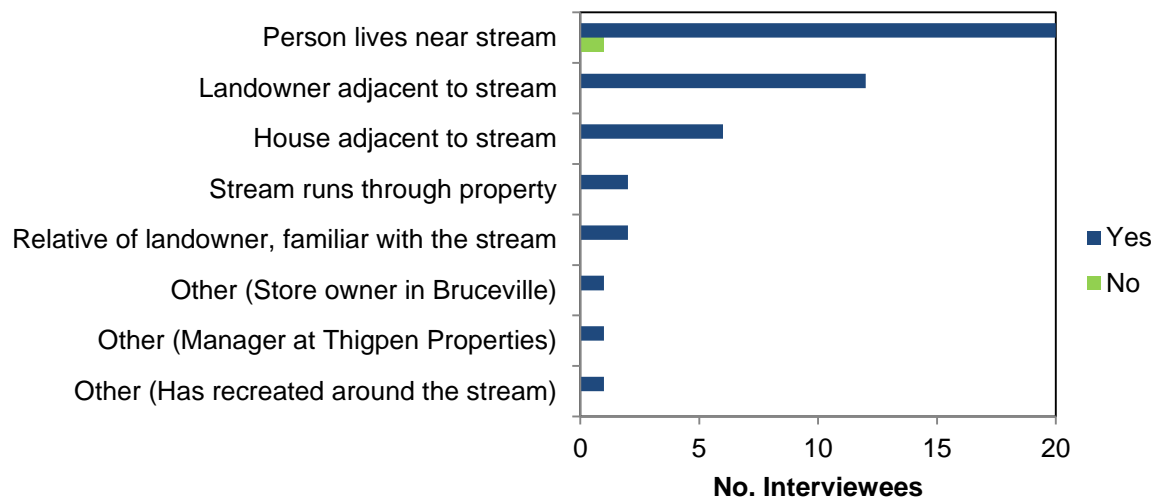


Figure 5. Number of interviewees that participated in interviews assessing recreation in Deer Creek (Water body 1242J). Categories represent the reason why interviewees were selected. Yes/No indicates whether interviews were completed.

The majority of people that were interviewed have been familiar with the water body for a period between 20 and 49 years (28%, Table 35). One of the interviewees was completely unfamiliar with the stream and therefore, was not willing to complete the interview, while another interviewee only has been familiar with the stream for three days. These interviews were excluded from further results bringing the total number of

completed interviews to 44. Most interviewees classified the stream as ephemeral or intermittent with perennial pools (Table 36).

Table 35. Number of years interviewees have been familiar with Deer Creek (Water body 1242J) (n = 46).

No. of Years Familiar	Percentage of Interviewees
≤ 5	4%
5 – < 10	20%
10 – < 20	20%
20 – < 50	28%
≥ 50	22%
Unfamiliar with stream	4%
Unable to obtain during interview	2%

Table 36. Stream classification by interviewees who are familiar with portions of Deer Creek (Water body 1242J) (n = 44).

Classification	Percentage of Interviewees
Ephemeral	43%
Intermittent	25%
Intermittent w/ perennial pools	27%
Perennial	5%

Half of the people that participated in the interviews and their families use Deer Creek for recreation. Among the interviewees that use the stream for recreation, 36% engage in primary contact recreation activities. Likewise, 36% engage in secondary contact 1 recreation activities (Table 37).

Table 37. Recreational activities reported in Deer Creek (Water body 1242J) that involve the person that was interviewed and his or her family. Note that a single interviewee can report one or more recreational activities.

Personal or Family Uses	Number of Reports
Primary Contact Recreation Activities	
Rafting (small pool style rafts used as a swim aids)	2
Swimming	2
Wading - Children	3
Wading - All ages, looking for fossils	1
Secondary Contact Recreation Activities	
Boating	1
Fishing (For consumption)	3
Other (Crawdad fishing)	1
Other (Releasing Turtles)	1
Wading - Adults	1
Noncontact Recreation Activities	
Hunting	11
Trapping	1
Playing on shore or banks	3
Other (Artifact hunting)	2
Other (Fossil hunting)	1
Other (Rock/Mineral hunting)	2
Other (Birthday parties)	1
Other (Harvesting grapes/berries)	1
Other (Hiking/walking)	3
Other (ATV)	2
Other (Bike riding)	1
Other (Horse riding)	2
Other (Rock throwing)	1
Other (Shooting)	2
Other (Watering cattle)	2
Picnicking	2
Watching wildlife or nature	5

Adults were the age class most frequently reported in recreational activities in Deer Creek involving the interviewee and his/her family (Fig. 2). The majority of interviewees that recreate in Deer Creek use the stream between 1 to 30 days per year (82%, average = 9 ± 9 days/year) and 5% use the stream 50 days per year. Three interviewees that use the stream did not specify what frequency they use it. Among the interviewees that specifically stated using the stream for primary contact recreation activities (i.e. swimming, rafting (small pool style raft used as a swim aid), and wading children), 25% reported using the stream for over 30 years, 25% have used the stream for nearly 20 years, 13% have used the stream for over 10 years, and 38% have used the stream for less than 10 years. Recreation in Deer Creek occurs in all seasons.

Half of the interviewees that do not use the stream for recreation have other personal interests. Other reasons given for not using the stream were related to physical characteristics of the stream (i.e., low water, steep banks, and water quality). The land manager that was interviewed stated that the property is currently only being used for raising cattle (Table 38).

Table 38. Reasons stated by interviewees for not using Deer Creek (Water body 1242J). Percentages are based on 22 people that stated not using the stream. Note that a single interviewee can report one or more reason for not using the stream for recreation.

Reasons for Not Using the Stream	Percentage of Interviewees
Other personal interests (Do not Specify)	50%
Physical characteristics (Low or no water)	32%
Physical characteristics (Steep banks)	5%
Physical characteristics (Water quality)	5%
Other (Business property only used for cattle)	5%
Unable to obtain during interview	9%

Interviewees have witnessed a variety of recreational activities currently occurring in Deer Creek (Table 39). These activities include primary contact recreation (i.e., swimming and rafting (small pool style raft used as a swim aid)) and secondary contact recreation (i.e., boating, kayaking, and fishing). The most frequently witnessed activities were fishing for consumption and hunting. Witnessed recreational activities involved mostly adults (60% of cases), but teenagers (20%) and children (20%) were also observed

recreating. Sixty six percent of interviewees have not witnessed recreation in Deer Creek.

Table 39. Recreational activities in Deer Creek (Water body 1242J) witnessed by interviewees. Note that a single interviewee may report witnessing one or more recreational activities.

Witnessed Recreational Activities	Number of Reports
Primary Contact Recreation Activities	
Swimming	2
Rafting (small pool style raft used as swim aid)	2
Secondary Contact Recreation Activities	
Boating	1
Kayaking	1
Fishing (unspecified)	1
Fishing (For consumption)	6
Other (Seining for minnows)	1
Noncontact Recreation Activities	
Playing on shore or banks	1
Hunting	5
Other (ATV)	1
Other (Help get stuck trucks of recreators out of mud in stream area)	1
Other (Hiking)	1
Other (Irrigation)	1
Picnicking	2

Interviewees also reported hearing of a variety of recreational activities occurring in Deer Creek (Table 40). These activities included primary contact recreation (i.e., swimming) and secondary contact recreation (i.e., fishing for consumption). The most frequent recreational activity that people have heard of occurring in Deer Creek is hunting. Recreational activities that interviewees have heard of involved mostly adults (58% of cases), but teenagers (29%), and a few children (8%), also have been heard of recreating in the stream. One interviewee reported hearing of hunting that involved people of all ages. Sixty one percent of interviewees have not heard of recreation occurring in Deer Creek. Information on recreation heard of was not collected during one interview.

Table 40. Recreational activities that interviewees have heard of occurring in Deer Creek (Water body 1242J). Note that a single interviewee can report hearing of one or more recreational activities.

Recreational Act. Heard of Occurring in the Stream	Number of Reports
Primary Contact Recreation Activities	
Swimming	1
Secondary Contact Recreation Activities	
Fishing (For consumption)	2
Noncontact Recreation Activities	
Hunting	8
Trapping	1
Other (Artifact Hunting)	2
Other (Mud races after a rain)	1
Other (Shooting guns and/or automatic weapons)	2
Other (Vandalism with graffiti on bridges)	1

Thirty percent of interviewees stated that recreational activities in Deer Creek have changed through time. Some of the most frequently stated reasons for changes in recreational use were changes in water level and changes in culture and personal interests. Other reasons stated for changes in recreational activities were changes in plant or wildlife populations (i.e., one person stated that “deer, turkey, and hogs are now more common in the area”, while another landowner believes that herbicides, pesticides, and fertilizers have negatively affected wildlife populations”), changes in land use, and restricted access (Fig. 6). Recreational activities that characterized Deer Creek in the past included primary contact activities (i.e. rafting (small pool style raft used as a swim aid), swimming, tubing, and wading by children, Table 41). Most of these primary contact activities are still occurring in the stream in the present time, although with slightly less frequency (Table 37, 39, and 40). One of the main reasons stated by interviewees for this decrease in primary contact recreation was lower water level (e.g., two interviewees stated that “the stream used to always hold water, but has not since the implementation of the Waco Dam”, another interviewee said that “past water levels were more consistent”, and another person said that “within last 5 years water levels have gone down”).

Other comments about primary contact recreation activities that have occurred in the past or that continue to occur in Deer Creek are: 1) One property owner mentioned a spot on

his property that he and his wife frequently use for picnics and wading (Site ID: 1242J.3), 2), and another landowner mentioned that in one occasion in 2011, high school students came on the property to party after graduation (which included swimming) (Site ID: 1242J.1).

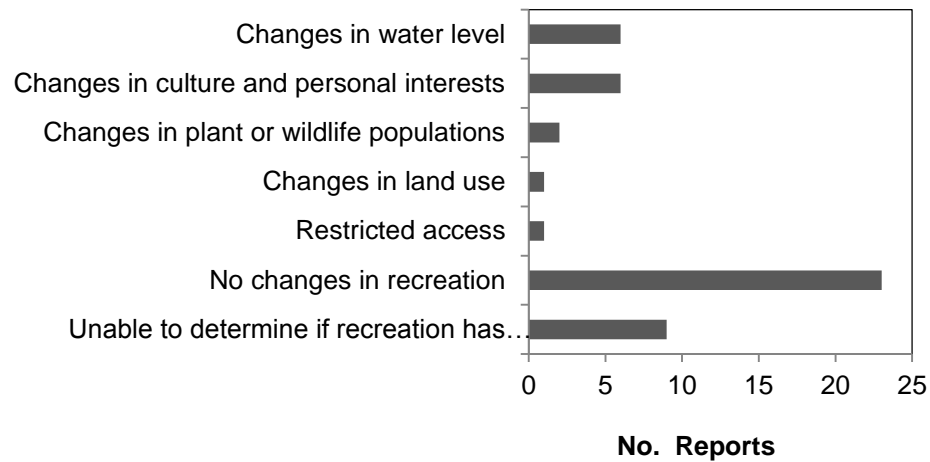


Figure 6. Reasons stated by interviewees for changes in recreational activities in Deer Creek (Water body 1242J). Note that a single interviewee can state one or more reasons for change in recreational activities.

Table 41. Recreational activities that characterized Deer Creek (Water body 1242J) in the past.

Recreational Activities	Past
Primary Contact Recreation Activities	
Rafting (small pool style rafts used as a swim aid)	2
Swimming	4
Tubing	1
Wading - Children	4
Secondary Contact Recreation Activities	
Fishing (For consumption)	10
Fishing (Catch and release)	1
Other (Crawdads fishing)	2
Wading - Adults	1
Kayaking	1
Other (Releasing turtles)	1
Noncontact Recreation Activities	
Camping	1
Picnicking	1
Other (Birthday parties)	1
Hunting	4
Trapping	3
Other (Artifact hunting)	3
Other (Fossil hunting)	1
Other (ATV)	1
Other (Bike riding)	2
Other (Hiking/Walking)	3
Other (Horse riding)	3
Other (Mineral hunting)	1
Other (Rock throwing)	1
Other (Shooting)	1
Other (Watering cattle)	1
Playing on shore or banks	1
Watching wildlife or nature	2

Unclassified water body 1242F (Pond Creek):

Twenty seven recreational use interviews were conducted in the Pond Creek area. Most of the interviews were conducted in person (81%) by two field technicians, while a few interviews (19%) were conducted over the phone by one technician. The majority of the interviewees were selected because the stream is adjacent to their house (56%). Other interviewees were selected because they are local residents that live near the stream (19%), the stream runs throughout their property (19%), or they own land adjacent to the stream (7%) (Fig.7).

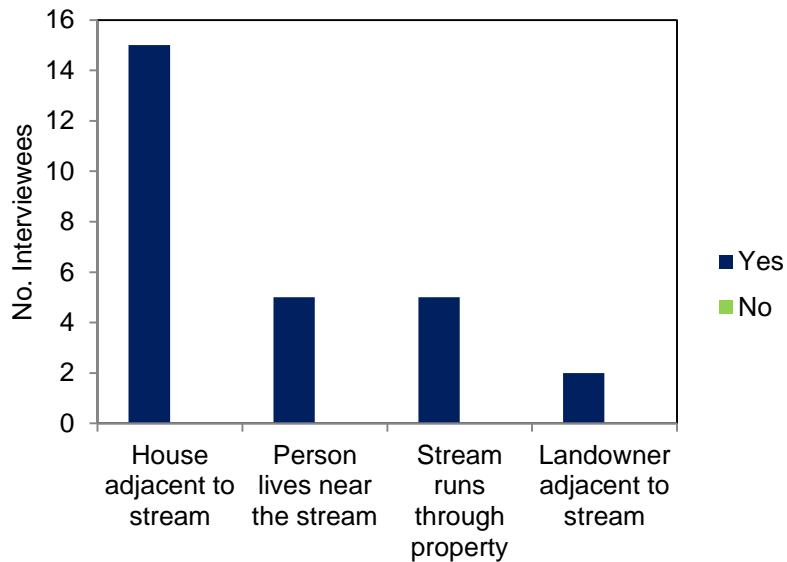


Figure 7. Number of interviewees that participated in interviews assessing recreation in Pond Creek (Water body 1242F). Categories represent the reason why interviewees were selected. Yes/No indicates whether interviews were completed.

The majority of people that were interviewed have been familiar with the water body for a period between 20 and 49 years (22%, Table 42). One of the interviewees was unfamiliar with the stream. This interview was excluded from further results bringing the total number of completed interviews to 26. Most interviewees classified the stream as intermittent with perennial pools, or ephemeral (Table 43).

Table 42. Number of years interviewees have been familiar with Pond Creek (Water body 1242F) (n = 27).

No. of Years Familiar	Percentage of Interviewees
≤ 5	7%
5 – < 10	13%
10 – < 20	4%
20 – < 50	22%
≥ 50	11%
Unfamiliar with stream	2%

Table 43. Stream classification by interviewees which are familiar with portions of Pond Creek (Water body 1242F) (n = 26).

Classification	Percentage of Interviewees
Ephemeral	27%
Intermittent	23%
Intermittent w/ perennial pools	38%
Perennial	12%

More than half of the people that participated in the interviews and their families use Pond Creek for recreation (58%). Among the interviewees that use the stream for recreation, 13% reported engaging in primary contact recreation activities which, include swimming, boogie boarding, tubing, and wading by children. Forty percent reported engaging in secondary contact 1 recreation activities, which include fishing for consumption, catch and release fishing, and wading by adults (Table 44).

Adults were the age class most frequently reported in recreational activities in Pond Creek involving the interviewee and his/her family (Fig. 2). The majority of interviewees that recreate in Pond Creek use the stream between 1 to 30 days per year (73%, average = 8 ± 4 days/year), and 7% use the stream 50 days per year. Three interviewees that use the stream did not specify what frequency they use it. Among the interviewees that specifically stated using the stream for primary contact recreation activities (i.e. swimming, tubing, and wading children), one person reported using the stream for over 10 years while, another person has been using the stream for the past 7 years. Recreation in Pond Creek occurs in all seasons.

Table 44. Recreational activities reported in Pond Creek (Water body 1242F) that involve the person that was interviewed and his or her family. Note that a single interviewee can report one or more recreational activities.

Personal or Family Uses	Number of Reports
Primary Contact Recreation Activities	
Swimming	1
Boogie boarding	1
Tubing	1
Wading - Children	1
Secondary Contact Recreation Activities	
Fishing (Catch and release)	3
Fishing (For consumption)	3
Wading - Adults	1
Noncontact Recreation Activities	
Playing on shore or banks	1
Hunting	7
Other (Artifact hunting)	2

Most of the interviewees that do not use the stream for recreation stated that the water level is low (91%). Other reasons given for not using the stream were related to water quality, limited access, and potentially dangerous wildlife (snakes) (Table 45).

Table 45. Reasons stated by interviewees for not using Pond Creek (Water body 1242F). Percentages are based on 11 people that stated not using the stream. Note that a single interviewee can report one or more reason for not using the stream for recreation.

Reasons for Not Using the Stream	Percentage of Interviewees
Physical characteristics (Low or no water)	91%
Physical characteristics (Water quality)	9%
Poor access	18%
Potentially dangerous wildlife (Copperhead snakes)	9%
Unable to obtain during interview	9%

Interviewees have witnessed a variety of recreation activities currently occurring in Pond Creek (Table 46). These activities include primary contact recreation (i.e., swimming, and wading by children) and secondary contact recreation (i.e., fishing, and wading by adults). The most frequently witnessed activities were hunting and fishing (catch and release). Witnessed recreation activities involved mostly adults (77% of cases), but teenagers (15%), and children (8%) were also observed recreating. Thirty eight percent of interviewees have not witnessed recreation in Pond Creek. Information on witnessed recreation was not collected during five interviews.

Table 46. Recreational activities in Pond Creek (Water body 1242F) witnessed by interviewees. Note that a single interviewee may report witnessing one or more recreational activities.

Witnessed Recreational Activities	Number of Reports
Primary Contact Recreation Activities	
Swimming	1
Wading - Children	1
Secondary Contact Recreation Activities	
Fishing (Catch and release)	3
Fishing (For consumption)	2
Wading - Adults	1
Noncontact Recreation Activities	
Hunting	8
Other (ATV)	1
Other (Shooting)	1
Other (Watering cattle)	1
Watching wildlife or nature	1

Interviewees also reported hearing of a variety of recreational activities occurring in Pond Creek (Table 47). These activities included primary contact recreation (i.e., swimming, and wading by children) and secondary contact recreation (i.e., fishing for consumption, and catch and release). The most frequent recreational activity that people have heard of occurring in the stream was hunting. Recreational activities that interviewees have heard of involved mostly adults (74% of cases), but teenagers (16%), and in one instance children (5%), also have been heard of recreating in the stream. One interviewee reported hearing of recreation in Pond Creek, but did not know the ages of the people

involved. Thirty five percent of interviewees have not heard of recreation occurring in Pond Creek. Information on recreation heard of was not collected during two interviews.

Table 47. Recreational activities that interviewees have heard of occurring in Pond Creek (Water body 1242F). Note that a single interviewee can report hearing of one or more recreational activities.

Recreational Act. Heard of Occurring in the Stream	Number of Reports
Primary Contact Recreation Activities	
Swimming	1
Wading - Children	1
Secondary Contact Recreation Activities	
Fishing (For consumption)	3
Fishing (Catch and release)	1
Noncontact Recreation Activities	
Playing on shore or banks	1
Hunting	11
Other (Artifact Hunting)	4

Twenty three percent of interviewees stated that recreational activities in Pond Creek have changed through time. The most frequently stated reason for changes in recreational use was changes in water level. Other reasons stated for changes in recreational activities were changes in water quality, changes in culture and personal interests, and changes in demographics (e.g., people who used to recreate on the stream have moved or died) (Fig. 8). Thirty one percent of interviewees were unable to determine if recreational activities in Pond Creek have changed through time. Recreational activities that characterized Pond Creek in the past include primary contact recreation (i.e. swimming, Table 48), which is still occurring in the stream in the present time (Tables 44, 46, and 47).

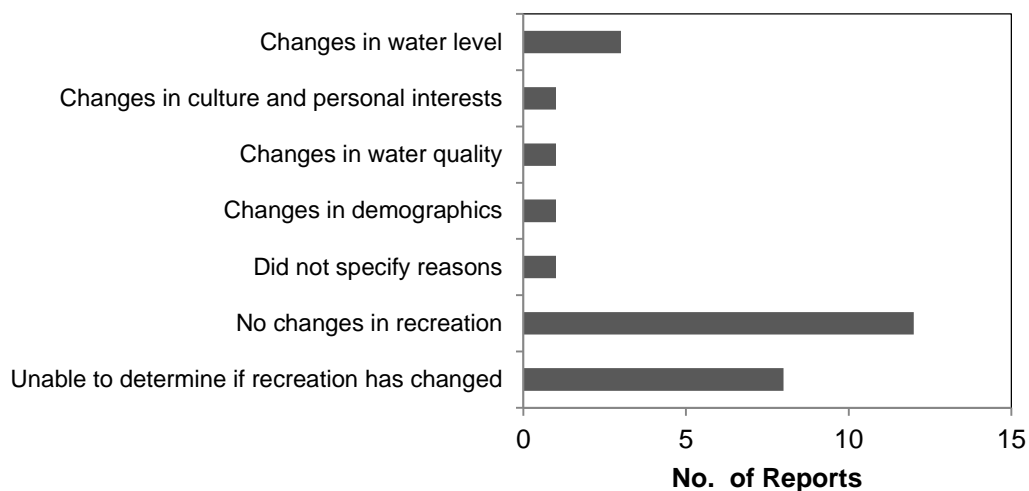


Figure 8. Reasons stated by interviewees for changes in recreational activities in Pond Creek (Water body 1242F). Note that a single interviewee can state one or more reasons for change in recreational activities.

Table 48. Recreational activities that characterized Pond Creek (Water body 1242F) in the past.

Recreational Activities	Past
Primary Contact Recreation Activities	
Swimming	3
Other (Baptisms)	1
Secondary Contact Recreation Activities	
Fishing (For consumption)	6
Fishing (Catch and release)	4
Noncontact Recreation Activities	
Hunting	3
Other (Artifact hunting)	1
Other (ATV)	1
Other (Horse Riding)	1
Other (Shooting)	1
Picnicking	1

Unclassified water body 1212A (Middle Yegua Creek):

Fifty nine recreational use interviews were conducted in the Middle Yegua Creek area. Most of the interviews were conducted in person (95%) by two field technicians, while a few interviews (5%) were conducted over the phone by one technician. The majority of the interviewees were selected because they are local residents that live near the stream (49%). Other interviewees were selected because the stream is adjacent to their house (25%), or they own land adjacent to the stream (19%) (Fig. 9).

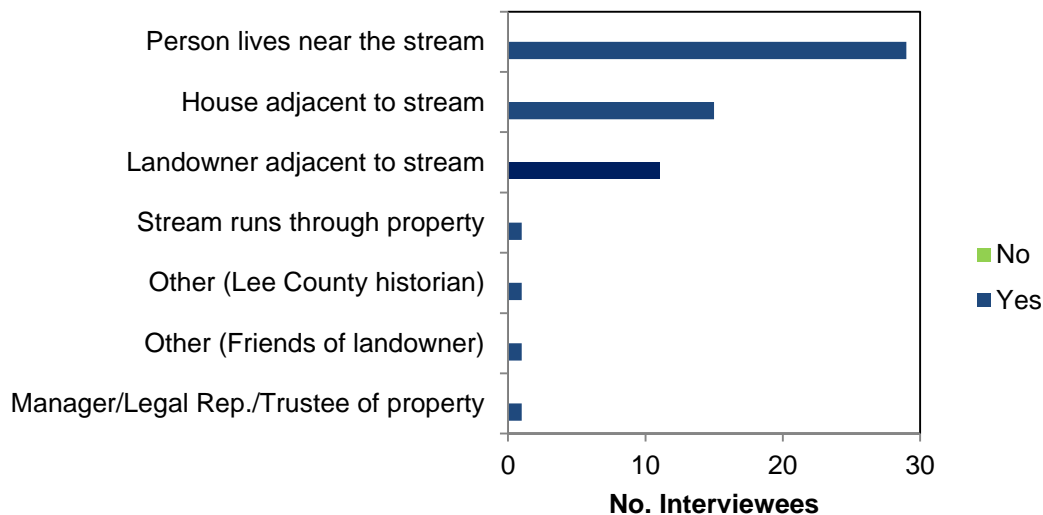


Figure 9. Number of interviewees that participated in interviews assessing recreation in Middle Yegua Creek (Water body 1212A). Categories represent the reason why interviewees were selected. Yes/No indicates whether the interviews were completed.

The majority of the people that were interviewed have been familiar with the water body for a period between 20 and 49 years (41%), while a large percentage of interviews have been familiar with the stream for over 50 years (27%, Table 49). One of the interviewees was unfamiliar with the stream. This interview was excluded from further results bringing the total number of completed interviews to 58. Most interviewees classified the stream as perennial (Table 50).

Table 49. Number of years interviewees have been familiar with Middle Yegua Creek (Water body 1212A) (n = 59).

No. of Years Familiar	Percentage of Interviewees
≤ 5	12%
5 – < 10	7%
10 – < 20	12%
20 – < 50	41%
≥ 50	27%
Unfamiliar with stream	2%

Table 50. Stream classification by interviewees, which are familiar with portions of Middle Yegua Creek (Water body 1212A) (n = 58).

Classification	Percentage of Interviewees
Ephemeral	16%
Intermittent	21%
Intermittent w/ perennial pools	5%
Perennial	59%

Half of the people that participated in the interviews, and their families use Middle Yegua Creek for recreation. Among the interviewees that use the stream for recreation, 24% reported engaging in primary contact recreation activities, which include swimming, hand fishing or noodling, knee boarding, rafting (small pool style raft used as a swim aid), and wading by children. Sixty nine percent reported engaging in secondary contact 1 recreation activities (Table 51).

Adults was the age class most frequently reported in recreational activities in Middle Yegua Creek involving the interviewee and his/her family (Fig. 2). Over half of the interviewees that recreate in Middle Yegua Creek use the stream between 1 to 30 days per year (55%, average = 10 ± 9 days/year), 31% use the stream between >30 to 180 days per year (average = 101 ± 55 days/year), and 4% use the stream between > 180 days per year (average = 334 ± 63 days/year). Among the interviewees that specifically stated using the stream for primary contact recreation activities (i.e. swimming, rafting (small pool style raft used as a swim aid), knee boarding, and wading children), 43% reported using the stream for approximately 10 years, 14% reported using the stream for

approximately 20 years, and 43% reported using the stream for approximately 30 years.

Recreation in Middle Yegua Creek occurs in all seasons.

Table 51. Recreational activities reported in Middle Yegua Creek (Water body 1212A) that involve the person that was interviewed and his or her family. Note that a single interviewee can report one or more recreational activities.

Personal or Family Uses	Number of Reports
Primary Contact Recreation Activities	
Knee boarding	1
Rafting (small pool style raft used as a swim aid)	1
Swimming	5
Wading - Children	1
Other (Hand fishing catfish and carp)	1
Secondary Contact Recreation Activities	
Wading - Adults	1
Fishing (Catch and release)	3
Fishing (For consumption)	17
Other (Bowfishing)	1
Noncontact Recreation Activities	
Camping	1
Picnicking	1
Other (Fossil hunting)	1
Hunting	15
Other (Harvesting grapes/berries)	1
Other (Hiking/walking)	2
Other (Watering Cattle)	4
Other (Did not specify)	1
Watching wildlife or nature	5

Most of the interviewees that do not use the stream for recreation have other personal interests. Other reasons given for not using the stream were related to physical characteristics of the stream (e.g., low water and water quality), poor access or lack of access due to the stream being located on private property, and potentially dangerous wildlife (e.g., rattlesnakes, copperheads, wild hogs, bobcats, mountain lions, coyotes) (Table 52).

Table 52. Reasons stated by interviewees for not using Middle Yegua Creek (Water body 1212A). Percentages are based on 29 people that stated not using the stream. Note that a single interviewee can report one or more reason for not using the stream for recreation.

Reasons for Not Using the Stream	Percentage of Interviewees
Other personal interests (Do not Specify)	62%
Physical characteristics (Low or no water)	7%
Physical characteristics (Water quality)	3%
Physical characteristics (Poor access)	3%
Other (Stream located on private property)	3%
Potentially dangerous wildlife	7%
Did not specify	14%

Interviewees have witnessed a variety of recreational activities currently occurring in Middle Yegua Creek (Table 53). These activities include primary contact recreation (i.e., swimming and wading by children) and secondary contact recreation (i.e., wading by adults, boating, and fishing). The most frequently witnessed activity was fishing for consumption. Witnessed recreational activities involved mostly adults (42% of cases), but teenagers (33%), and children (24%) were also observed recreating. Forty percent of interviewees have not witnessed recreation in Middle Yegua Creek.

Interviewees also reported hearing of a variety of recreational activities occurring in Middle Yegua Creek (Table 54). These activities included secondary contact recreation (i.e., boating, canoeing, and fishing for consumption). The most frequent activities that people have heard of occurring in Middle Yegua Creek were hunting and fishing for consumption. Recreational activities that interviewees have heard of involved mostly adults (53% of cases), but teenagers (32%), and in few instances children (8%), also have been heard of recreating in the stream. In few cases, recreational activities that interviewees have heard of involved people of all ages (8%). Fifty seven percent of interviewees have not heard of recreation occurring in Middle Yegua Creek. Information on recreation heard of was not collected during two interviews.

Table 53. Recreational activities in Middle Yegua Creek (Water body 1212A) witnessed by interviewees. Note that a single interviewee may report witnessing one or more recreational activities.

Witnessed Recreational Activities	Number of Reports
Primary Contact Recreation Activities	
Swimming	2
Wading - Children	1
Secondary Contact Recreation Activities	
Wading - Adults	1
Fishing (Unspecified)	1
Fishing (Catch and release)	1
Fishing (For consumption)	33
Other (Crawfish hunting)	2
Boating	3
Noncontact Recreation Activities	
Camping	1
Hunting	4
Other (Hiking)	1

Table 54. Recreational activities that interviewees have heard of occurring in Middle Yegua Creek (Water body 1212A). Note that a single interviewee can report hearing of one or more recreational activities.

Recreational Act. Heard of Occurring in the Stream	Number of Reports
Secondary Contact Recreation Activities	
Boating	1
Canoeing	2
Fishing (For consumption)	10
Noncontact Recreation Activities	
Camping	1
Hunting	13
Other (Collecting pecans)	1
Other (Illegal dumping)	2
Other (Photographer taking photos under the bridge crossing of Hwy 77)	1

Thirty one percent of interviewees stated that recreational activities in Middle Yegua Creek have changed through time. The most frequently stated reason for changes in recreational use was changes in water level. Other reasons stated for changes in recreational activities were changes in culture and personal interests, changes in demographics (e.g., people who use to recreate in the past have grown up and moved away), limited access, changes in physical characteristics of the stream (e.g., there used to be a lake upstream of survey point 1212A.14), and changes in water quality (Fig. 10). Recreational activities that characterized Middle Yegua Creek in the past include primary contact recreation (i.e. swimming, bridge diving, and wading by children) (Table 55). Most of these activities are still occurring in the stream in the present time, although with slightly lower frequency (Tables 51, 53, and 54). One of the main reasons stated by interviewees for this decrease in primary contact recreation was lower water levels (e.g., one interviewee stated that “water levels used to be higher to allow for more recreation”. Another interviewee stated that “recreation does not occur as often since a local mining company has stopped pumping groundwater back into the stream. Swimming was more frequent in the late 1980's”). Other reasons for reduction in primary contact recreation are changes in demographics (e.g., one interviewee commented that “all the children [around the survey site] have moved out and do not use the stream anymore. Swimming was common between 1950's-2009”). Other comments about current, and past primary contact recreation activities in Middle Yegua Creek are summarized below (Table 56).

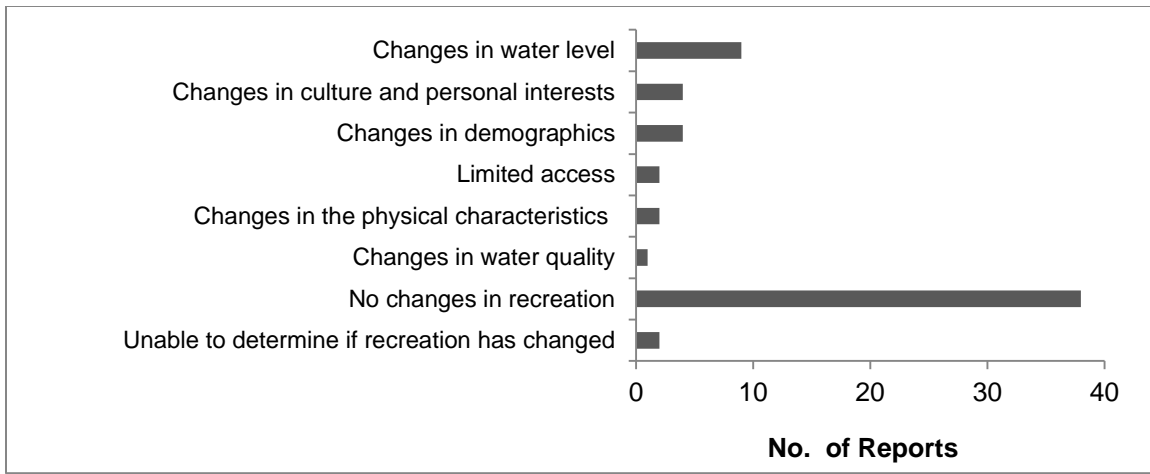


Figure 10. Reasons stated by interviewees for changes in recreational activities in Middle Yegua Creek (Water body 1212A). Note that a single interviewee can state one or more reasons for change in recreational activities.

Table 55. Recreational activities that characterized Middle Yegua Creek (Water body 1212A) in the past.

Recreational Activities	Past
Primary Contact Recreation Activities	
Swimming	11
Bridge diving (Jumping off of bridge at CR 326)	1
Wading - Children	1
Other (Hand fishing or noodling)	1
Secondary Contact Recreation Activities	
Wading - Adults	1
Fishing (For consumption)	22
Noncontact Recreation Activities	
Playing on shore or banks	1
Camping	2
Hunting	11
Other (Watering cattle)	1

Table 56. Comments from interviewees regarding current and past primary contact recreation activities in Middle Yegua Creek (Water body 1212A).

Comment	Nearest Site ID:
1) One interviewee and his/her family have witnessed children, teenagers, and adults wading in the stream especially after rain, as well as frequent fishing activities on the stream throughout the year. They are very concerned and interested in maintaining high water quality standards for the stream.	1212A.13
2) Another interviewee commented that the stream is used for primary contact only after a few days of good rain when the water level is higher. Knee boarding involves an individual holding onto a rope that is tied to a four-wheeler, the participant is oriented on a short boogie board in the water, and pulled by the four-wheeler from the banks.	1212A.12
3) One interviewee stated that his/her family swim in the stream and has witnessed swimming during the spring and summer months since 1983 to the present. The ages of the swimmers range from 6 to upwards of 30.	1212A.14
4) One interviewee mentioned that teenagers attempted to raft after a heavy rain event one time.	1212A.2
5) Since 2002 to the present, one woman in the family swims when the water levels are high during the spring and summer months.	1212A.16
6) One interviewee showed field technicians a picture of an infant playing in the stream with children and teenagers of all ages. Wading has been occurring since 2000 to the present, during the spring, summer, and fall, and involves children, teenagers, and adults in the family.	1212A.8
7) The interviewee has lived on the stream and recreated in it since 10 years old (1978), and is now an adult that frequently swims and recreates (240 days/y) in the stream.	1212A.13
8) One interviewee has witnessed families with children of all ages that wade in the water especially after rain events. This has been occurring since 1984 during the summer months.	1212A.13
9) The interviewee began participating in recreational activities and swimming in the stream during teenage years and into adulthood (2001 to present), during spring, summer, and fall.	1212A.12
10) A landowner commented that when he was in the commissioner's office, there was garbage collection and a dump open to the public to dump appliances/furniture/etc. 24/7. But, the dump did not comply with environmental regulations. Restrictions and operational changes were put in place, but they could not be maintained, and the dump was closed. After which, people started illegally dumping into the streams, and people started using the streams a lot less for recreation (wading children and swimming were frequent prior to around 1985). Also, the landowner suggested that mining operations affect the amount of base water flow, and lower water levels have reduced the amount that people recreate in the stream.	1212A.12

Acknowledgements

Many people contributed to the success of this Recreational Use Attainability Analysis including TCEQ Staff, and graduate students and under graduate students at Texas A&M University.

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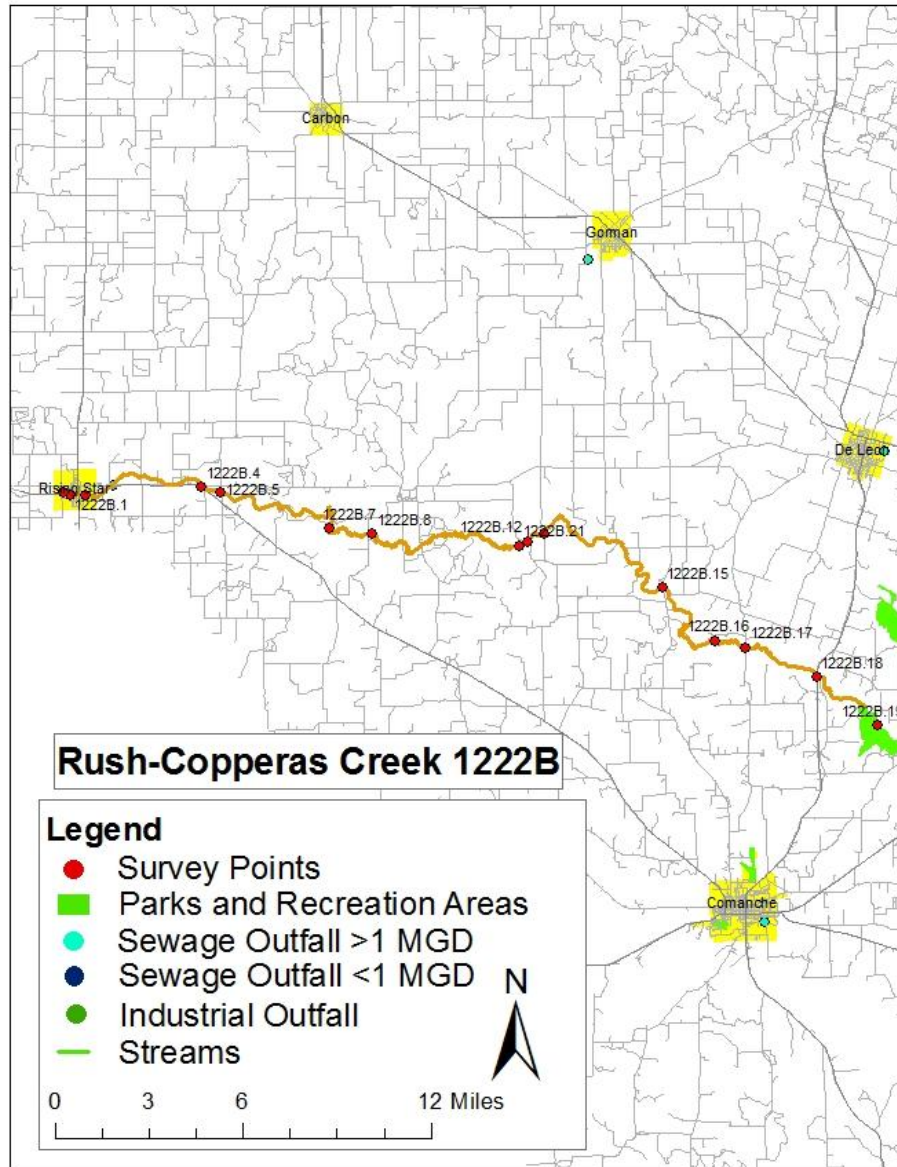
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Zhaohui Chi for managing the RUAA GIS.

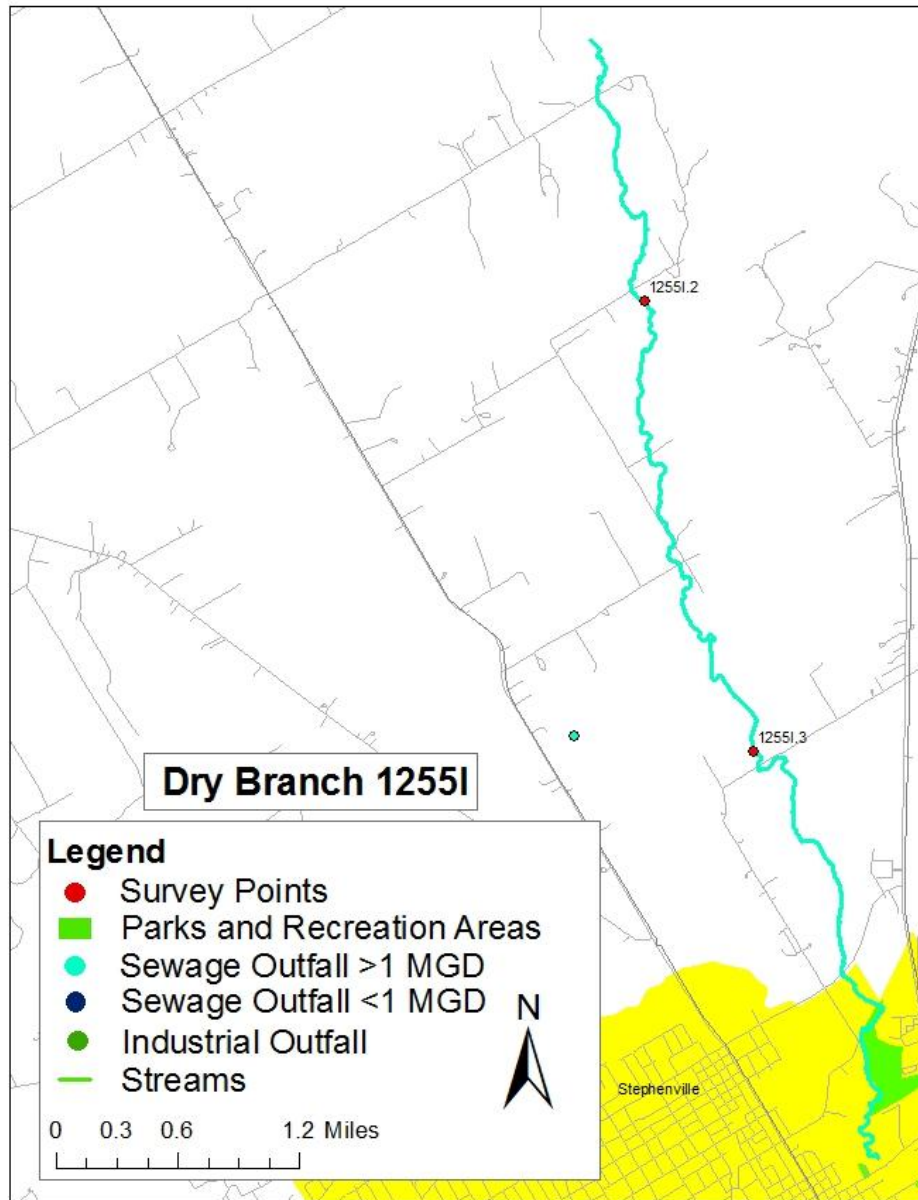
Bobby Allcorn, Katharine Bradley, Andrew Jackson, Maxwell Fontanier, Michele Horner, and Shesh Jhala for their hard work collecting project field data.

Appendices

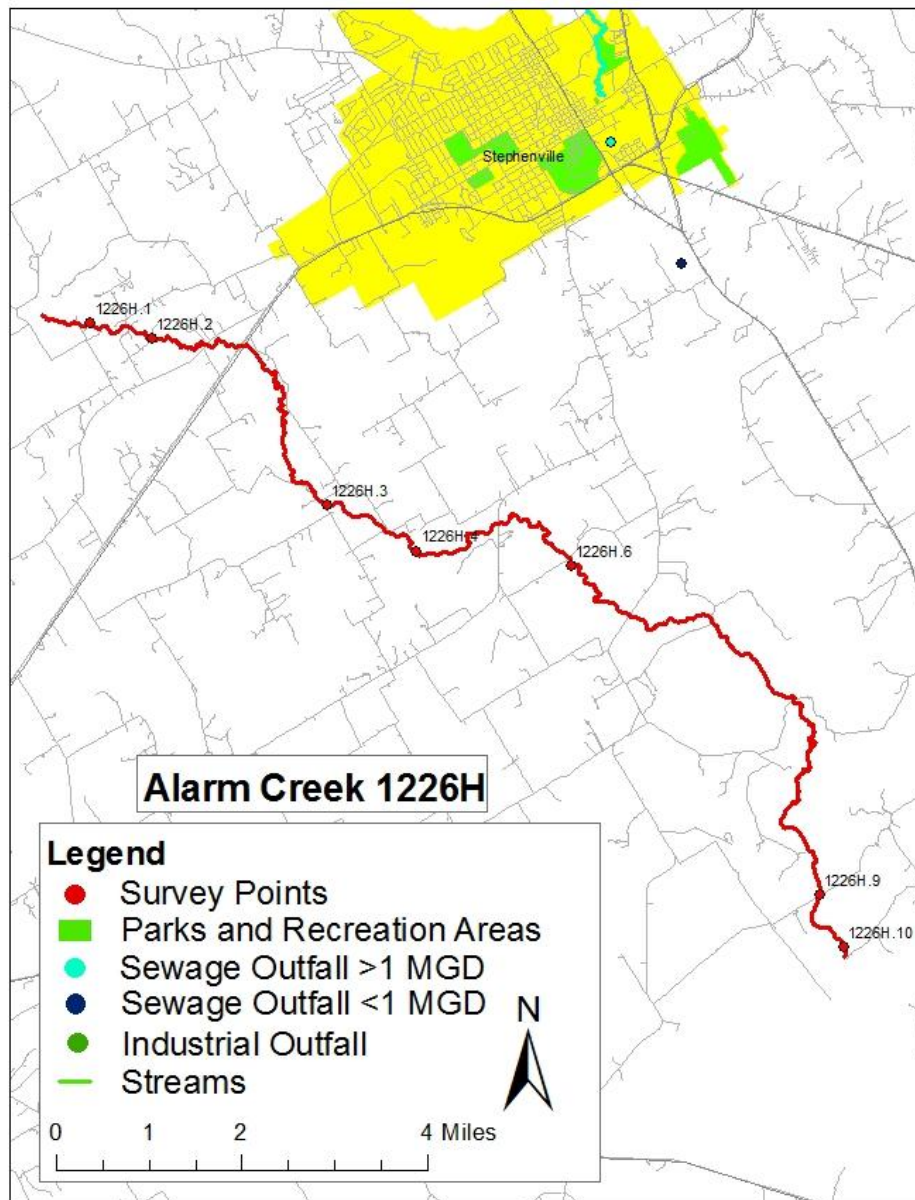
Appendix 1. Maps of study area and RUAA project streams.



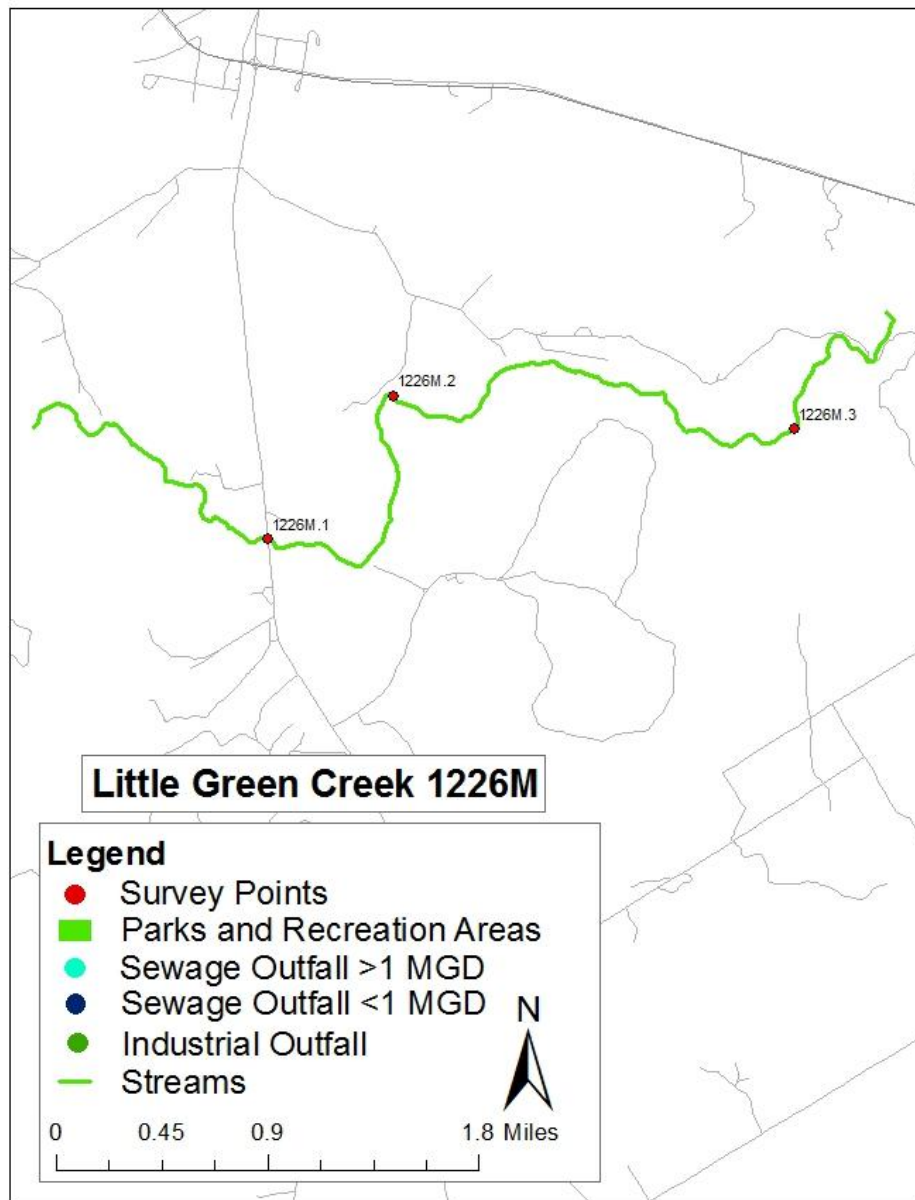
Map of survey sites, recreation areas, and wastewater outfalls along Rush-Copperas Creek.



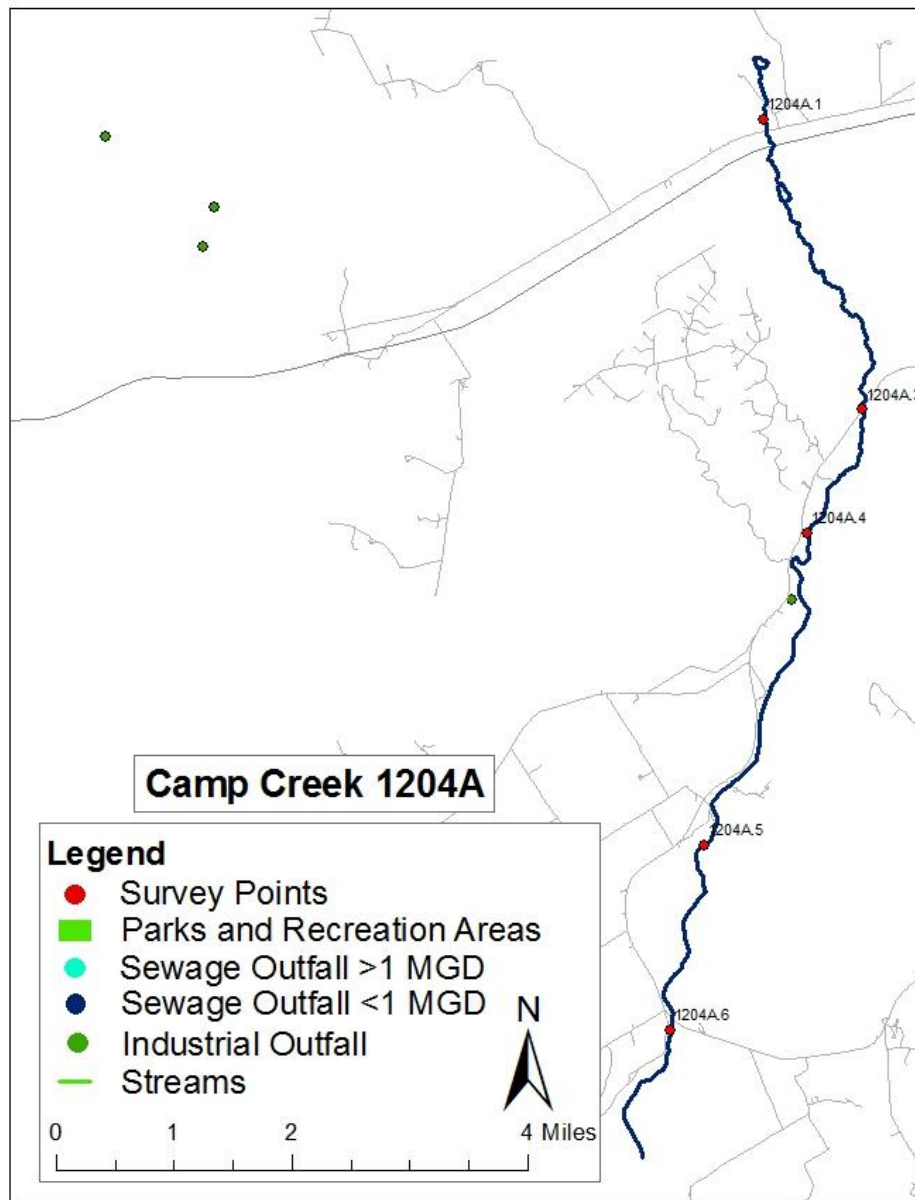
Map of survey sites, recreation areas, and wastewater outfalls along Dry Branch.



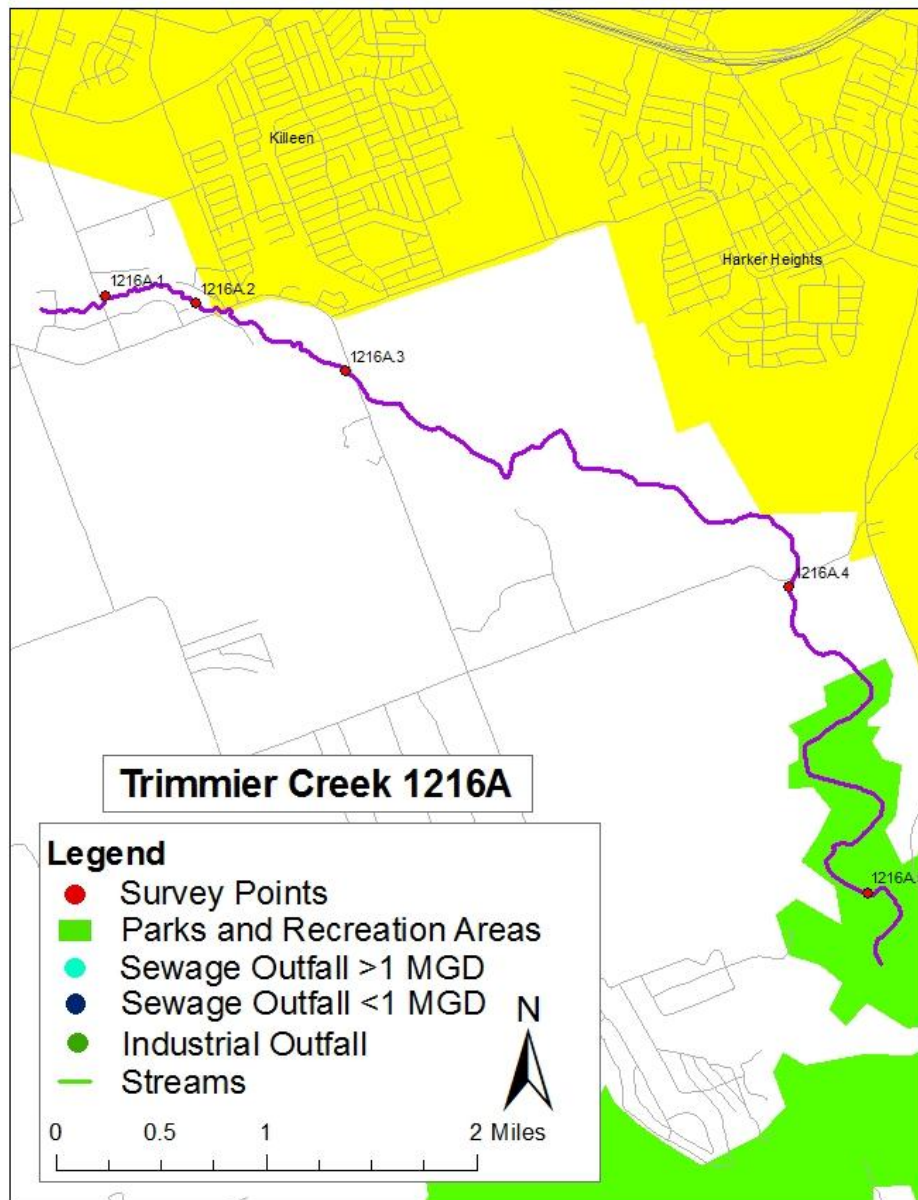
Map of survey sites, recreation areas, and wastewater outfalls along Alarm Creek.



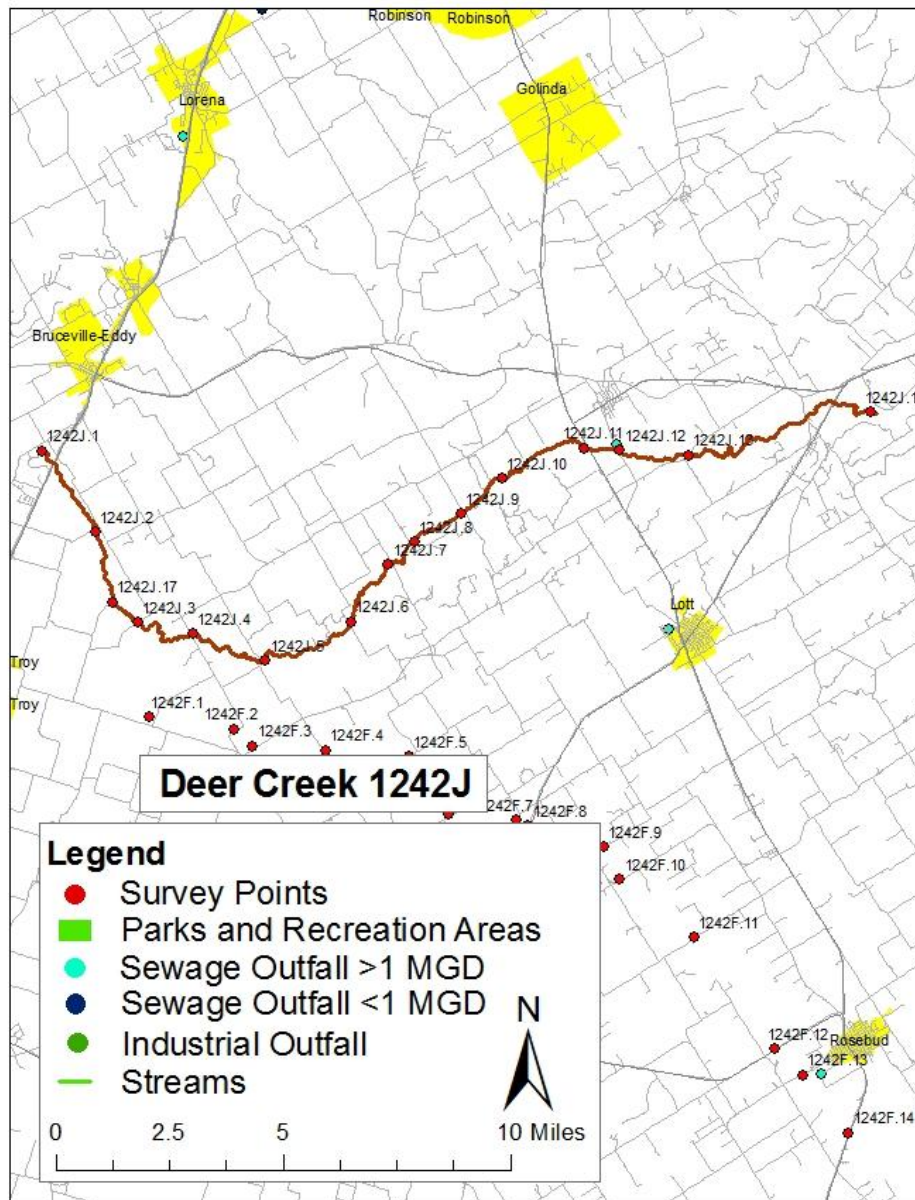
Map of survey sites, recreation areas, and wastewater outfalls along Little Green Creek.



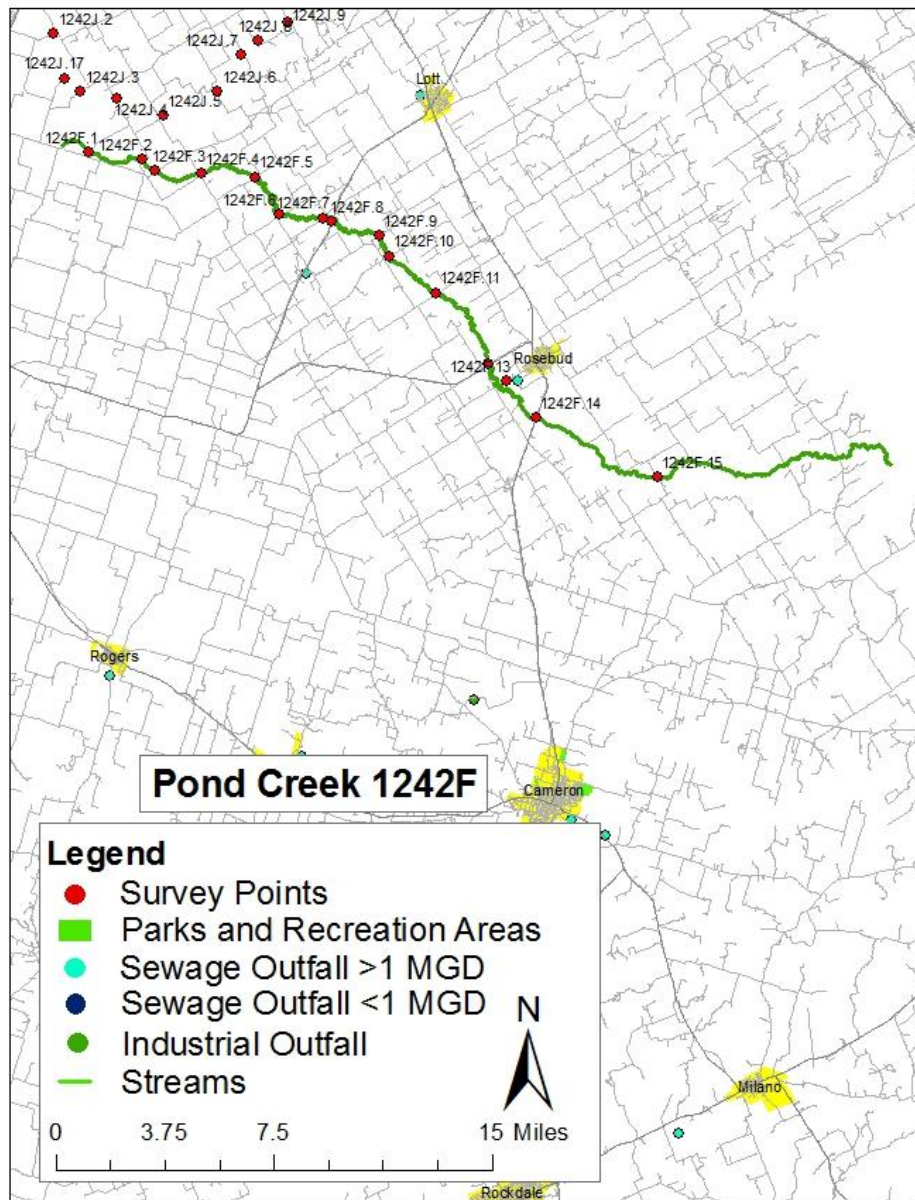
Map of survey sites, recreation areas, and wastewater outfalls along Camp Creek.



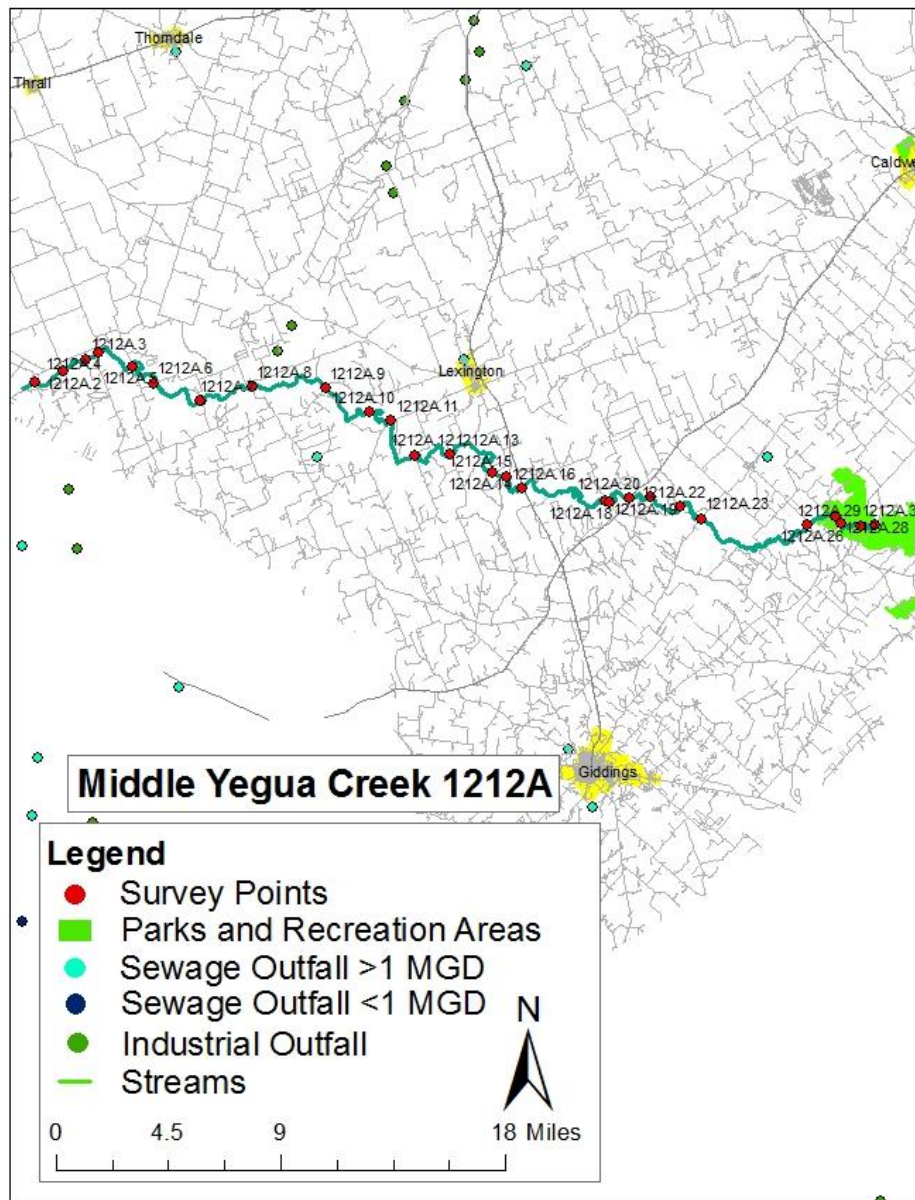
Map of survey sites, recreation areas, and wastewater outfalls along Trimmier Creek.



Map of survey sites, recreation areas, and wastewater outfalls along Deer Creek.



Map of survey sites, recreation areas, and wastewater outfalls along Pond Creek.



Map of survey sites, recreation areas, and wastewater outfalls along Middle Yegua Creek.

Appendix 2

Contact Information Form

(This form must be completed prior to conducting a RUAA survey.)

River or stream name: _____

Notify the contacts that a recreational use-attainability analysis is being planned for the river or stream. Document whether or not the entity was notified, the name of the person contacted, and the date they were notified about the proposed RUAA project.

Required Local Contacts:

TCEQ region staff

Notified: ☐ Yes ☐ No Date: _____

Name: _____

Clean Rivers Partners (River Authority and other local partners)

Notified: ☐ Yes ☐ No Date: _____

Name: _____

Texas Parks and Wildlife Department

Notified: ☐ Yes ☐ No Date: _____

Point of Contact: Pat Radloff

512.389.8730

patricia.radloff@tpwd.state.tx.us

Texas State Soil Water Conservation Board

Notified: ☐ Yes ☐ No Date: _____

Point of Contact: Aaron Wendt

254.773.2250 ext. 232

awendt@tsswcb.state.tx.us

Suggested Additional Local Contacts to Notify (Notify the contacts that a recreational use-attainability analysis is being planned for the river or stream. If contacted, include whether or not the entity was notified, the name of the person contacted, and the date they were notified about the proposed RUAA project on a separate page and attach it to this form):

Local Parks and Recreation Departments	<input type="checkbox"/> Yes <input type="checkbox"/> No
Local Government/Jurisdiction	<input type="checkbox"/> Yes <input type="checkbox"/> No
Local Recreation Groups	<input type="checkbox"/> Yes <input type="checkbox"/> No
Conservation Groups	<input type="checkbox"/> Yes <input type="checkbox"/> No
Local County Extension Agent	<input type="checkbox"/> Yes <input type="checkbox"/> No
Watershed Groups	<input type="checkbox"/> Yes <input type="checkbox"/> No
Long-term Landowners/Adjacent Landowners	<input type="checkbox"/> Yes <input type="checkbox"/> No
Texas Stream Team	<input type="checkbox"/> Yes <input type="checkbox"/> No
Canoe Clubs	<input type="checkbox"/> Yes <input type="checkbox"/> No
City Commissioners Office	<input type="checkbox"/> Yes <input type="checkbox"/> No
Real estate agents	<input type="checkbox"/> Yes <input type="checkbox"/> No
Local non-profits	<input type="checkbox"/> Yes <input type="checkbox"/> No
City/county offices (Engineer, Health, Law Enforcement)	<input type="checkbox"/> Yes <input type="checkbox"/> No
Flood control districts	<input type="checkbox"/> Yes <input type="checkbox"/> No
Councils of Government	<input type="checkbox"/> Yes <input type="checkbox"/> No
TPWD Game Warden	<input type="checkbox"/> Yes <input type="checkbox"/> No
Other: _____	<input type="checkbox"/> Yes <input type="checkbox"/> No

Appendix 3

Field Data Sheets –RUAA Survey

(complete for each site)

Site:

Data Collectors & Contact Information:	
Date & Time:	County Name:
Stream Name:	
Segment No. or nearest downWater body No.:	
Description of Site:	

A. Stream Characteristics:

1. Check the following channel flow status that applies.

☐ dry ☐ no flow ☐ low ☐ normal ☐ high ☐ flooded

2. Check the following stream type that applies on the day of the survey:

☐ Ephemeral: A stream which flows only during or immediately after a rainfall event, and contains no refuge pools capable of sustaining a viable community of aquatic organisms.

☐ Intermittent: A stream which has a period of zero flow for at least one week during most years. Where flow records are available, a stream with a seven-day, two-year low-flow (7Q2) flow of less than 0.1 cubic feet per second is considered intermittent.

☐ Intermittent w/ perennial pools: An intermittent stream which maintains persistent pools even when flow in the stream is less than 0.1 cubic feet per second.

☐ Perennial: A stream which flows continuously throughout the year. Perennial streams have a 7Q2 equal to or greater than 0.1 cubic feet per second.

☐ Designated or unclassified tidal stream: A stream that is tidally influenced. If you checked this box, you will need to contact the TCEQ Water Quality Standards Group and evaluate whether or not a bathing beach is located along the tidal stream and whether or not a bathing beach is located along the estuary, bay or Gulf water that the tidal stream flows into.

3. Riparian Zone (Mark dominant categories with L (Left Bank) and R (Right Bank). Bank orientation is determined by the investigator facing downstream.)

_____ Forest	_____ Urban	_____ Rip rap
_____ Shrub dominated corridor	_____ Pasture	_____ Concrete
_____ Herbaceous marsh	_____ Row crops	Other (specify): _____
_____ Mowed/maintained corridor	_____ Denuded/Eroded bank	

4. Ease of bank access to the water body: ☐ Easy ☐ Moderately easy ☐ Moderately difficult ☐ Difficult

5. Please describe access opportunities or explain why the site is not easily accessible (Attach photos for documentation):

6. Dominant Primary Substrate

☐ Cobble ☐ Sand ☐ Silt ☐ Mud/Clay ☐ Gravel ☐ Bedrock ☐ Rip rap ☐ Concrete

B. Primary Contact Water Recreation Evaluation:

- Primary contact recreation definition: Activities that are presumed to involve a significant risk of ingestion of water (e.g. wading by children, swimming, water skiing, diving, tubing, surfing, and the following whitewater activities: kayaking, canoeing, and rafting).

1. Were water recreation activities that involve a significant risk of ingestion (full body immersion) observed at this site?

☐ Yes ☐ No primary contact recreation activities were observed

a. Check the following boxes of primary contact recreation activities observed at the time of the sampling event at the site (Attach photos of the activities or lack of activities).

☐ Wading-Children ☐ Tubing

☐ Wading-Adults ☐ Surfing

☐ Swimming ☐ Whitewater-kayaking, canoeing, rafting

☐ Water skiing ☐ Other: _____

☐ Diving ☐ frequent public swimming-created by publicly owned land or commercial operations

b. Check the number of individuals observed at the site: ☐ None ☐ 1-10 ☐ 11-20 ☐ 20-50 ☐ greater than 50

c. Check the following that apply regarding the individuals proximity to the water body.

☐ Water in mouth or nose of the individual ☐ Primary touch: Individual's body (or portion) immersed in water

☐ Secondary touch: fishing, pets and related contact with water ☐ Individual is in a boat touching water

☐ Individual is on shore near water within 8 meters (25ft) of water ☐ Individual is well away from water between 8 and 30 meters (100 ft) ☐ Not applicable

2. If primary contact recreation activities are not observed, describe the physical characteristics of the water body that may hinder the frequency of primary contact (depth, etc.) (Attach photos, etc. for

documentation).

3. Describe if there is public access (e.g. parks, roads, etc.) (Attach photos, maps, etc. for documentation).

4. Is an area with primary contact recreation activities or a bathing beach (e.g. state/local parks with swimming, etc.) located near (e.g. within 5 miles upstream and downstream) this site?

C. Secondary Contact Water Recreation Evaluation:

- Secondary contact recreation 1: Activities that commonly occur but have limited body contact incidental to shoreline activity (e.g. fishing, canoeing, kayaking, rafting and motor boating). These activities are presumed to pose a less significant risk of water ingestion than primary contact recreation but more than secondary contact recreation 2.

- Secondary contact recreation 2: Activities with limited body contact incidental to shoreline activity (e.g. fishing, canoeing, kayaking, rafting and motor boating) that are presumed to pose a less significant risk of water ingestion than secondary contact recreation 1. These activities occur less frequently than secondary contact recreation 1 due to physical characteristics of the water body or limited public access.

1. Were water recreation activities observed at the site, but the nature of the recreation does not involve a significant risk of ingestion (e.g. secondary contact recreation activities)? ☐ Yes ☐ No secondary contact recreation activities were observed

a. Check the following boxes of secondary contact recreation activities that were observed at the time of the sampling event at the site (Attach photos of activities or lack of activities).

- ☐ Fishing
- ☐ Boating-commercial, recreational
- ☐ Non-whitewater-kayaking, rafting, canoeing
- ☐ No secondary contact recreation activities were observed
- ☐ Other secondary contact activities: _____

b. Check the number of individuals observed at the site.

☐ None ☐ 1-10 ☐ 11-20 ☐ 20-50 ☐ greater than 50

c. Check the following that apply regarding the individuals proximity to the water body.

- ☐ Secondary touch: fishing, pets and related contact with water ☐ In a boat touching water
- ☐ Body on shore near water within 8 meters (25ft) of water ☐ Body well away from water between 8 and 30 meters (100 ft)

2. If secondary contact recreation activities are not observed, describe the physical characteristics of the water body that may hinder the frequency of secondary contact (Attach photos, etc. for documentation).

3. If secondary contact recreation activities are observed, how often do water recreational activities occur that do not involve a significant risk of water ingestion? ☐ frequently ☐ infrequently

Please describe how often the activities occur? ☐ Unknown ☐ Never ☐ Daily ☐ Monthly ☐ Yearly

4. If infrequently, what is the reason? ☐ physical characteristics of the water body ☐ limited public access
☐ other

If other, list reasons: _____

5. Describe the physical characteristics of the water body that hinders the frequency of secondary contact recreation (depth, etc.) (Attach photos or depth measurements, etc. for documentation).

6. Describe why there is limited public access (e.g. lack of roads, river or stream banks overgrown, etc.) (Attach photos, maps, etc. for documentation).

D. Noncontact Recreation Evaluation

Noncontact recreation applies to water bodies where recreation activities do not involve a significant risk of water ingestion (e.g. activities with limited body contact incidental to shoreline activity, including birding, hiking, and biking), and where primary and secondary contact recreation uses do not occur because of unsafe conditions, such as barge traffic.

1. Provide site-specific information and documentation (including photographs) regarding unsafe conditions, recreation activities, and presence or absence of water recreation activities.

E. Stream Channel and Substantial Pools Measurements

Please check the following which best describes the river or stream (A non-wadeable stream is one that is too deep to wade. Dry streams are considered wadeable.): ☐ Wadeable ☐ Non-wadeable

1. Wadeable Streams

Determine whether or not the average depth at the thalweg is greater than 0.5 meters and if there are substantial pools with a depth of 1 meter or greater. Walk an approximately 300 meter reach (total) at the site and take the following measurements within the 300 meter reach. Measurements should be taken during dry weather flows (sustained or typical dry, warm-weather flows between rainfall events, excluding unusual antecedent conditions of drought or wet weather

Also, take photos facing upstream, downstream, left bank, and right bank at the 30 meters, 150 meters, and 300 meters.

Photos #s (30 meters) Upstream____ Downstream____ Left Bank ____ Right Bank____

Photos #s (150 meters) Upstream____ Downstream____ Left Bank ____ Right Bank____

Photos #s (300 meters) Upstream____ Downstream____ Left Bank ____ Right Bank____

a) Substantial pools - Measure the length of each pool within the 300 meter reach (if > 10 pools only measure 10 pools). Also measure the width (at the widest point) and deepest depth of each pool. A substantial pool is considered a pool greater than 10 meters in length for the purposes of a RUAA Survey. Report measurements to 2 significant figures. If depths are too deep to measure then report >1.5 meters.

	Length (meters)	Width (meters)	Depth (meters)
Pool 1			
Pool 2			
Pool 3			
Pool 4			
Pool 5			
Pool 6			
Pool 7			
Pool 8			
Pool 9			
Pool 10			

b) Average depth at the thalweg – Take depth measurements every 30 meters within the 300 meter reach to calculate an average depth at the thalweg (at least 11 measurements needed). Report measurements to 2 significant figures. If depths are too deep at a particular transect to measure then report >1.5 meters. Use 1.5 when calculating the mean.

Distance	Depth (meters)
0 meters	
30 meters	
60 meters	
90 meters	
120 meters	
150 meters	
180 meters	
210 meters	
240 meters	
270 meters	
300 meters	
Average	

c) Stream width - Measure (1) the width at one point which represents the typical average width of the 300 meter reach; (2) the width at the narrowest point of the stream within the 300 meter reach; and (3) the width at the widest point of the stream within the 300 meter reach. Report measurements to 2 significant figures.

Measurement Type	Width (meters)
Typical Average Width of 300 meter reach	
Width at narrowest point of the stream within 300 meter reach	
Width at the widest point of the stream within 300 meter reach	

2. *Non-wadeable Streams*

If accessible, take 11 width measurements which represent typical widths of the 300 meter reach. If the water is too deep the entire 300 meter reach then record the estimated average width of the water body. Report measurements to 2 significant figures.

Also, take photos facing upstream, downstream, left bank, and right bank at .

Photos #s (30 meters) Upstream____ Downstream____ Left Bank ____ Right Bank____

Photos #s (150 meters) Upstream____ Downstream____ Left Bank ____ Right Bank____

Photos #s (300 meters) Upstream____ Downstream____ Left Bank ____ Right Bank____

# Measurements	Width (meters)
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	

F. Additional RUAA Information. Summarize your observations for the entire 300 meter reach.

1. Check the following activities observed over the site reach.

- | | |
|---|---|
| <input type="checkbox"/> Drinking or water in mouth | <input type="checkbox"/> Playing on shoreline |
| <input type="checkbox"/> Bathing | <input type="checkbox"/> Picnicking |
| <input type="checkbox"/> Walking | <input type="checkbox"/> Motorcycle/ATV |
| <input type="checkbox"/> Jogging/running | <input type="checkbox"/> Hunting/Trapping |
| <input type="checkbox"/> Bicycling | <input type="checkbox"/> Wildlife watching |
| <input type="checkbox"/> Standing | <input type="checkbox"/> None |
| <input type="checkbox"/> Sitting | <input type="checkbox"/> Other: _____ |
| <input type="checkbox"/> Lying down/sleeping | |

2. Are there permanent or long-term hydrologic modifications that are constructed and operated in a way that affects the recreational uses? ☐ Yes ☐ No (If yes, please provide supporting documentation and photos.)

Comments: _____

3. Check any channel obstructions that apply (Attach photos).

- | | | | | | |
|---|---------------------------------|---|--------------------------------------|--|--------------------------|
| <input type="checkbox"/> Culverts | <input type="checkbox"/> Fences | <input type="checkbox"/> Log jams | <input type="checkbox"/> Rip rap | <input type="checkbox"/> Water control structure | <input type="checkbox"/> |
| <input type="checkbox"/> Barbed wire | <input type="checkbox"/> Dams | <input type="checkbox"/> Thick vegetation | <input type="checkbox"/> Low bridges | <input type="checkbox"/> None | |
| <input type="checkbox"/> Utility pipe <input type="checkbox"/> Other (specify): _____ | | | | | |

4. Check all surrounding conditions that promote recreational activities (Attach photos of evidence or unusual items of interest).

- | | | | |
|--|---|---|--|
| <input type="checkbox"/> Campgrounds | <input type="checkbox"/> Stairs/walkway | <input type="checkbox"/> Roads (paved/unpaved) | <input type="checkbox"/> |
| Other: _____ | | | |
| <input type="checkbox"/> Playgrounds | <input type="checkbox"/> Boating access (ramps) | <input type="checkbox"/> Populated area | <input type="checkbox"/> None of the Above |
| <input type="checkbox"/> Rural area | <input type="checkbox"/> Beach | <input type="checkbox"/> Docks or rafts | |
| <input type="checkbox"/> Residential | <input type="checkbox"/> Bridge crossing | <input type="checkbox"/> Commercial outfitter | |
| <input type="checkbox"/> National forests | <input type="checkbox"/> Commercial boating | <input type="checkbox"/> Trails/paths (hiking/biking) | |
| <input type="checkbox"/> Urban/suburban location | <input type="checkbox"/> Nearby school | <input type="checkbox"/> Power Line Corridor | |
| <input type="checkbox"/> Golf Course | <input type="checkbox"/> Paved parking lot | <input type="checkbox"/> Parks (national/city/county/state) | |
| <input type="checkbox"/> Sports Field | <input type="checkbox"/> Unimproved parking lot | <input type="checkbox"/> Public Property | |

Comments: _____

5. Check all surrounding conditions that impede recreational activities (Attach photos of evidence or unusual items of interest).

- ☐ Private Property ☐ Fence
☐ No trespass sign ☐ Barge/ship traffic
☐ Wildlife ☐ Industrial
☐ Steep slopes ☐ None of the Above
☐ No public access ☐ Other: _____
☐ No roads

Comments: _____

6. Check any indications of human use (Attach photos).

- ☐ Roads ☐ RV/ATV Tracks ☐ NPDES Discharge ☐ Organized event
☐ Rope swings ☐ Camping Sites ☐ Gates on corridor ☐ No Human Presence
☐ Dock/platform ☐ Fire pit/ring ☐ Children's toys
☐ Foot paths/prints ☐ Fishing Tackle ☐ Remnants of kids' play
☐ Other: _____

Comments: _____

7. Please list any additional items that may impede recreation, such as excessive aquatic vegetation or algae, excessive debris, garbage, snakes, alligators, abundant wildlife, etc.? (Attach photos).

8. Please list any evidence of sustained aquatic habitat such as clam shells, aquatic or marsh vegetation, turtle shells, etc. (Attach photos)

9.. Is the site located in a wildlife preserve with large wildlife (i.e. waterfowl) population? ☐ Yes ☐ No

10.. Please document any other relevant information regarding recreational activities and the water body in general (for example, area outside of the stream reach evaluated).

Severity Value

Description

☐ **1 No Flow**

When a flow severity of 1 is recorded for a sampling visit, record a flow value of 0 ft³/s (using parameter code 00061) for that sampling visit. A flow severity of 1 describes situations where the stream has water visible in isolated pools. There should be no obvious shallow subsurface flow in sand or gravel beds between isolated pools. “No flow” not only applies to streams with pools but also to long reaches of streams that have water from bank to bank but no detectable flow.

☐ **2 Low Flow**

When stream flow is considered low, record a flow-severity value of 2 for the visit, along with the corresponding flow measurement (parameter code 00061). In streams too shallow for a flow measurement where water movement is detected, record a value of < 0.10 ft³/s. **Note:** Use a stick or other light object to verify the direction of water movement. Make sure the movement is downstream and not the effect of wind. What is low for one stream could be high for another.

☐ **3 Normal Flow**

When stream flow is considered normal, record a flow severity value of 3 for the visit, along with the corresponding flow measurement (parameter code 00061). “Normal” is highly dependent on the stream. Like low flow, what is normal for one could be high or low for another.

☐ **4 Flood Flow**

Flow-severity values for high and flood flows have long been established by the EPA and are not sequential. Flood flow is reported as a flow severity of 4. Flood flows are those which leave the confines of the normal stream channel and move out onto the floodplain (either side of the stream).

☐ **5 High Flow**

High flows are reported as a flow severity of 5. High flow would be characterized by flows that leave the normal stream channel but stay within the stream banks.

☐ **6 Dry**

When the stream is dry, record a flow-severity value of 6 for the sampling visit. In this case the flow (parameter code 00061) is not reported. This will indicate that the stream is completely dry with no visible pools.

Appendix 4

RUAA Interview Form

Stream Name: _____ Segment #: _____ Site: _____

Interviewer's Name: _____

Date & Time (include AM or PM): _____

Interviewed: ☐ In person ☐ By phone ☐ By mail ☐ By e-mail

☐ No interviews were conducted

If no interviews were conducted, please provide an explanation:

*Are you willing to respond to a short survey about this stream? ☐ Yes ☐ No

Interviewee selected because (e.g., resource manager, Gov. official, conservationist, property owner, local resident, standing by stream, etc.)

Questions:

1. Are you familiar with this stream? ☐ Yes ☐ No If yes, how many years? _____

If yes, proceed to #2. If no, stop here and do not conduct an interview.

2. What location(s) along the stream are you familiar with:

3. Have the interviewer characterize the stream flow. Since the interviewer may not be familiar with TCEQ's definitions or distinction between the different water bodies, please refer to the definitions listed below when asking this question.

☐ Ephemeral: A stream which flows only during or immediately after a rainfall event

☐ Intermittent: A stream which has a period of zero flow for at least one week during most years. (Channel contains flowing water for only a portion of the year and surface water may be absent at times.)

☐ Intermittent w/ perennial pools: An intermittent stream which maintains persistent pools even when flow in the stream is less than 0.1 cubic feet per second. (When not flowing, the water may remain in isolated pools.)

☐ Perennial: A stream which flows continuously throughout the year.

4. Have you or your family personally used the stream for recreation? ☐ Yes ☐ No

If yes, proceed to #6. If no, proceed to #5.

5(a). List reasons stream not used. _____

5(b). Proceed to #7.

6.) a) How do you use the stream? ☐ Swimming ☐ Wading-Children

☐ Water Skiing ☐ Wind surfing ☐ Tubing ☐ Wading-Adults

☐ Hunting ☐ Kayaking ☐ Rafting ☐ Trapping ☐ SCUBA diving

☐ Snorkeling ☐ Fishing ☐ Boating ☐ Canoeing ☐ Skin Diving

b) When did these uses occur (e.g. year(s); season) and how often (times/year)?

c) What location did these uses occur (get specific location and mark on a map)?

7. Have you observed others using this stream for recreation? ☐ Yes ☐ No

If yes, proceed to #8. If no, proceed to #9.

8. a) What kinds of uses have you witnessed? ☐ Swimming ☐ Wading-Children

☐ Water Skiing ☐ Wind surfing ☐ Tubing ☐ Wading-Adults

☐ Hunting ☐ Kayaking ☐ Rafting ☐ Trapping ☐ SCUBA diving

☐ Snorkeling ☐ Fishing ☐ Boating ☐ Canoeing ☐ Skin Diving

b) When did these uses occur (e.g. year(s); season) and how often (times/year)?

c) What location did these uses occur (get specific location and mark on a map)?

9. Have you heard about anyone using this stream for recreation? ☐ Yes ☐ No

If yes, proceed to #10. If no, conclude the interview.

10. a) What kind of uses have you heard about? ☐ Swimming ☐ Wading-Children

☐ Water Skiing ☐ Wind surfing ☐ Tubing ☐ Wading-Adults

☐ Hunting ☐ Kayaking ☐ Rafting ☐ Trapping ☐ SCUBA diving

☐ Snorkeling ☐ Fishing ☐ Boating ☐ Canoeing ☐ Skin Diving

b) When did these uses occur (e.g. year(s); season) and how often (times/year)?

c) What location did these uses occur (get specific location and mark on a map)?

11. Can you recommend someone else we could contact that knows the stream? ☐ Yes ☐ No

If yes, list person's contact information: _____

12. Additional comments (from the interviewee or interviewer):

Appendix 5

RUAA Summary

(Not part of the Field Data Sheet)

This form should be filled out after RUAA data collection is completed. Use the Contact Information Form, Field Data Sheets from all sites, Historical Information Review, and other relevant information to answer the following questions on the water body.

Name of water body: _____

Segment No. or Nearest DownWater body No.: _____

Classified?: _____

County: _____

1. Observations on Use

a. Do primary contact recreation activities occur on the water body?

☐ frequently ☐ seldom ☐ not observed or reported ☐ unknown

b. Do secondary contact recreation 1 activities occur on the water body?

☐ frequently ☐ seldom ☐ not observed or reported ☐ unknown

c. Do secondary contact recreation 2 activities occur on the water body?

☐ frequently ☐ seldom ☐ not observed or reported ☐ unknown

d. Do noncontact recreation activities occur on the water body?

☐ frequently ☐ seldom ☐ not observed or reported ☐ unknown

2. Physical Characteristics of Water Body

a. What is the average thalweg depth? _____ meters

b. Are there substantial pools deeper than 1 meter? ☐ yes ☐ no

c. What is the general level of public access?

☐ easy ☐ moderate ☐ very limited

3. Hydrological Conditions of site visits (Based on Palmer Drought Severity Index)

☐ Mild-Extreme Drought ☐ Incipient dry spell ☐ Near Normal ☐ Incipient wet spell ☐ Mild-Extreme Wet